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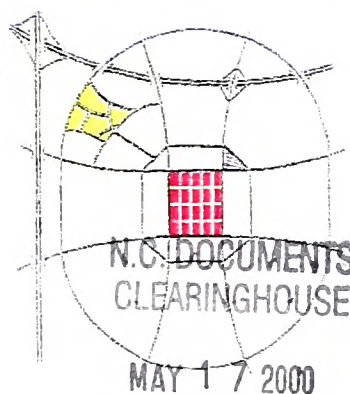


North Carolina Department of Transportation
Statewide Planning Branch

THOROUGHFARE PLAN



The Crown Jewel of the Piedmont



for the
CITY of KING

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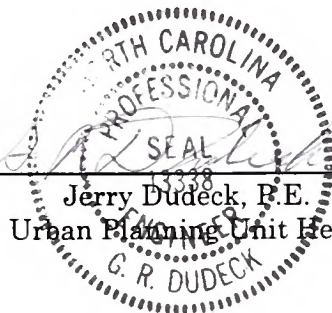
September, 1999

City of King Thoroughfare Plan

Prepared by the:
Statewide Planning Branch
Planning and Environment Division
North Carolina Department of Transportation

In Cooperation with:
The City of King
The Federal Highway Administration
U. S. Department of Transportation

September 8, 1999



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Executive Summary

This plan documents the findings of a thoroughfare study for the City of King. Below is a listing and brief description of these findings:

The geographic location of King, North Carolina is shown on Figure 1, preceding the Executive Summary. The Thoroughfare Plan map is shown in Figure 2. Projects included in the 1998-2004 Transportation Improvement Program (TIP) include a TIP project number.

Major Thoroughfares

- **Widening of King-Tobacco Road (Main Street) - RJR entrance to SR 1105 (Meadowbrook Drive).** This project is listed in the North Carolina Transportation Improvement Program (Project R-2201). Its widening would increase roadway travel capacity allowing more vehicles to be served by commercial and industrial development.
- **US 52 / Trinity Road Interchange** - The purpose of a second interchange in the King Planning area is attributed to the wide speculation of tremendous growth in Stokes County (mainly King, N.C.), an increase in Winston Salem Commuters, and the unexpected growth caused by the US 74 construction project.
- **Trinity Road Extension** - This facility would be a necessary compliment to the US 52 / Trinity Road Interchange, and would carry traffic from the north to northwest parts of King to US 52 without utilizing Main Street, an already congested facility.

Minor Thoroughfares

- **Spainhour Extension (connecting from Old US 52 to NC66)** - This facility would serve as a passage from NC 66 to the Main Street commercial development easing the traffic burden along Kirby Road and at critical future high volume intersections such as King Street and Kirby Road, King Street and Mountainview, and Mountainview and Helsabeck Road.
- **Pilot View Rd Extension (Parallel to Main Street)** - The construction of a parallel facility to the west of Main Street (extending from Ingram Drive connecting to Pilot View road and extending to Brown Road) would carry approximately seven to eight thousand vehicles per day, splitting a portion of the future Main Street traffic away from an already high congested facility.
- **Industrial Drive Extension to Meadowbrook** - This facility would be utilized by mostly industrial traffic and would act as a through route (parallel to US 52) from Meadowbrook to King Tobacco Road.

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KING

THOROUGHFARE PLAN

Legend
Existing
Proposed

MAJOR THOROUGHFARE

MINOR THOROUGHFARE

INTERCHANGE

GRADE SEPARATION

Adopted by:

City of King

Recommended Approval
by Statewide Planning Branch

North Carolina
Department of Transportation



KING

STOKES COUNTY

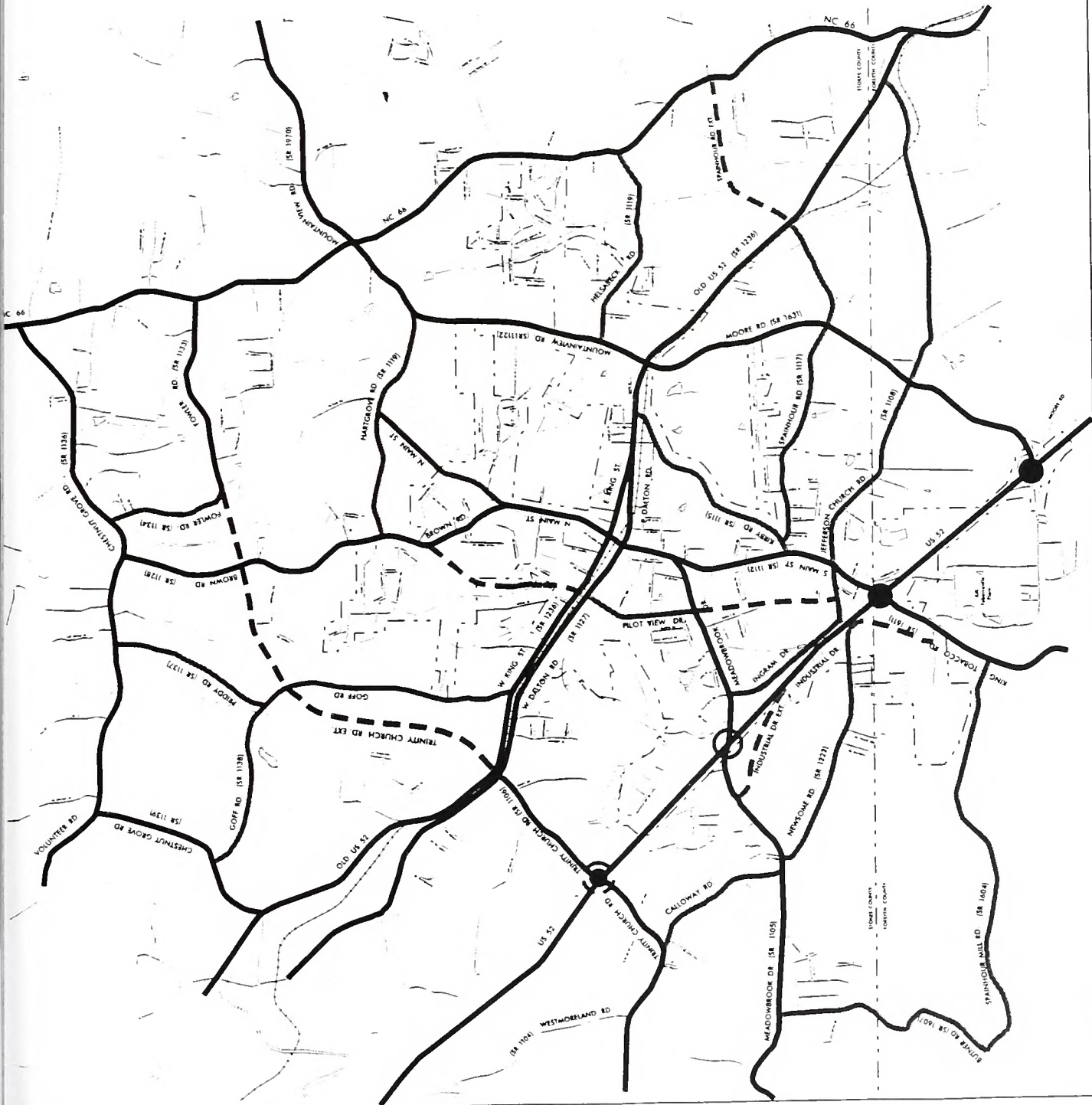
NORTH CAROLINA

NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

US DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



BASE MAP SEPTEMBER 20, 1994



Chapter 1

Introduction

Overview

Officials of the City of King, prompted by a desire to adequately plan for the future transportation needs of King, requested the North Carolina Department of Transportation's assistance in conducting a thoroughfare plan study. The primary concern of the City Council was the increased traffic congestion in the central business district, and what reasonable options were available to lighten congestion on the main artery and connecting arteries traveling throughout King.

The objective of thoroughfare planning is enable the transportation network to be progressively developed to adequately meet the transportation needs of a community or region as land develops and traffic volumes increase. By not planning now for our future transportation needs, unnecessary costs to the physical, social, and economic environment may very well be incurred. Thoroughfare planning is a tool that can be used by local officials to plan for future transportation needs, while at the same time reducing the costs to our environment.

The primary purpose of this report is to present the findings and recommendations of the thoroughfare plan study conducted for the City of King. The secondary purpose of this report is to document the basic thoroughfare planning principles and procedures used in developing these recommendations. This report can be divided into eight (8) parts.

Chapter 1 covers the highlights of the study. Chapters 2 and 3 provides a detailed description of the Thoroughfare Plan study recommendations and address different methods by which these recommendations can be implemented. Chapter 4 covers study procedures and findings. Chapters 5 and 6 provide a detailed description of population, land use, and environmental concerns that were considered while developing this plan. Chapter 7, covers traffic model development, and Chapter 8 addresses alternate plan evaluation.

Information that will be especially useful to the practitioners is provided in the Appendix. The principles of thoroughfare planning are covered in Appendix A, a detailed tabulation of all routes on the Thoroughfare Plan and a graphical representation of typical cross-sections can be found in Appendix B and C respectively. Information related to subdivision ordinances is covered in Appendix D. Appendix E displays housing and employment base year data (1994) and future projections (2025). Appendix F explains Pedestrian Policy Guidelines as it pertains to the North Carolina Department of Transportation, and Appendix G includes the Transportation Improvement Program(TIP) Project process.

Background

King, located in the piedmont region of North Carolina, is a small urban city located in the south-west portion of Stokes County below the Virginia State line. King is approximately 10 miles from Winston Salem its nearest metropolitan area. The city is mostly residential, with commercial development along the main artery through its central to southern parts and industrial development in its southern most region.

The North Carolina Department of Transportation and the City of King are jointly responsible for the proposed thoroughfare plan improvements. Cooperation between the state and the city is of primary concern if the recommendations outlined above are to be successfully implemented. The plan has been mutually adopted by all parties, and it is the responsibility of the City of King to implement the plan following the guidelines set forth in Chapters 3. This plan was adopted by the City of King on "a date not yet determined" and by the Department of Transportation on "a date not yet determined."

It is important to note that the recommended plan is based on anticipated growth within the planning area as indicated by past trends and future projections. Prior to construction of any these projects, a more detailed study will be required to revisit development trends an to determine specific locations and design requirements.

GEOGRAPHIC LOCATION FOR KING NORTH CAROLINA

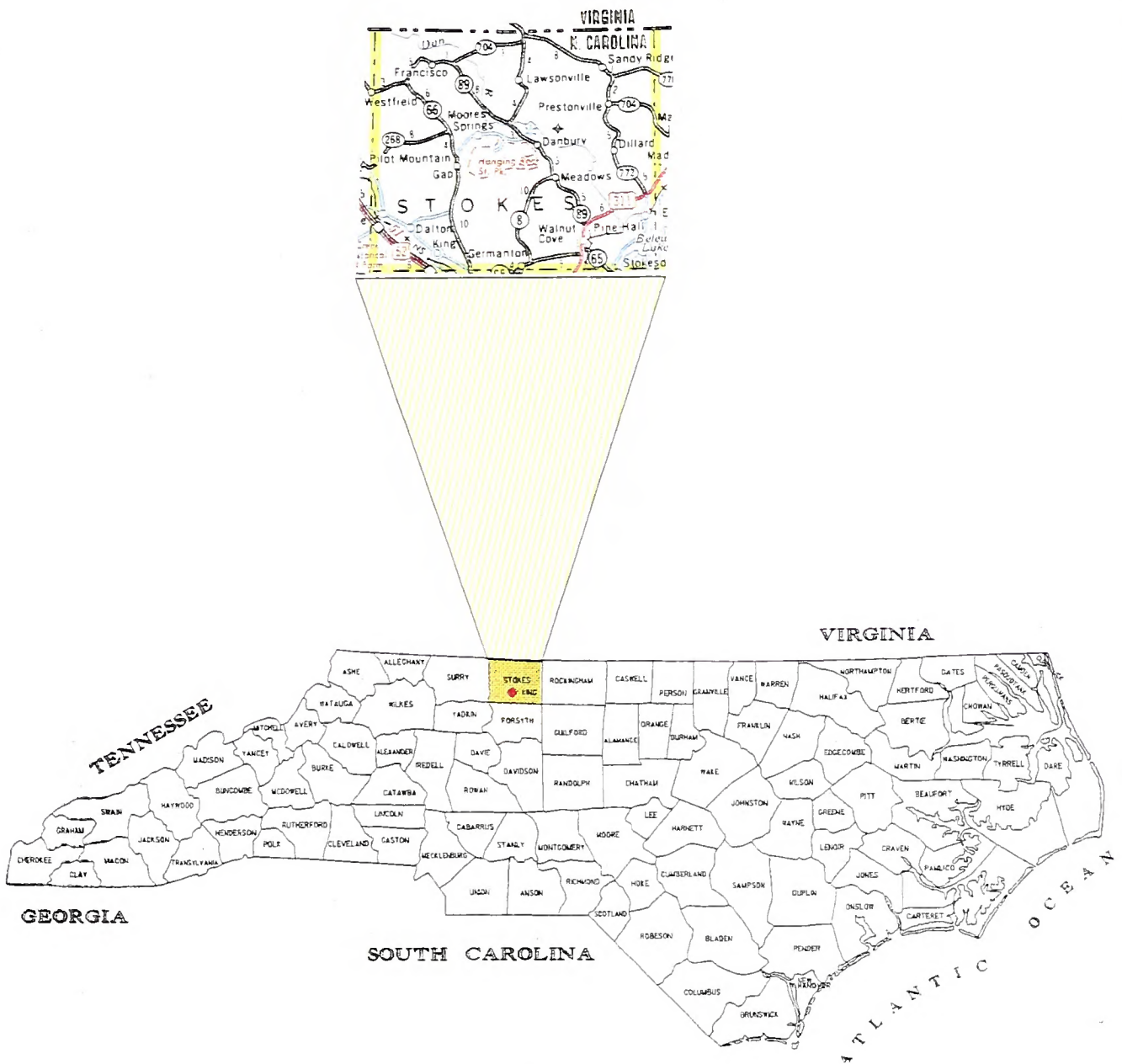


FIGURE 1

Chapter 2

Recommended Thoroughfare Plan

Intent of the Thoroughfare Plan

A thoroughfare plan study identifies existing and future deficiencies in municipal, county, regional, or state-wide transportation systems. Based on these findings, this plan designates any specific needs for any new and/or improved transportation facilities to satisfy these deficiencies. The thoroughfare plan also provides a modeled representation of the travel characteristics or uses in a planning area. These uses are grouped into functional classifications such as major thoroughfares, minor thoroughfares, and local streets. A full description of these various systems and their subsystems is given in Appendix A.

This chapter presents thoroughfare plan recommendations for the year 2025. The goal of this study is to serve the anticipated traffic and land development uses for the City of King. The foremost objective of this plan is to reduce traffic congestion, improve travel safety, and to guide the development of the King's urban street system in a manner consistent with its changing traffic demands.

Thoroughfare Plan Recommendation

Below is a brief description of the major and minor transportation facilities which carry high volumes of traffic within and through the urban area. Each description is accompanied by an appropriate recommendation if needed.

Major Thoroughfares

Main Street - Five Forks Road and King/Tobacco Road

Main Street is a major thoroughfare common to other names such as King-Tobacco Road, Five Forks Road, and Brown Road. South Main Street is the southernmost segment between Moore Road and Meadowbrook Drive (also known as King-Tobacco Road) has both four (4) lane and two (2) lane roadway sections. This area serves as the major commercial area for King and is connected by an interchange with US Highway 52. Approximately .2 miles south of the existing interchange (in Forsyth) is the entrance to RJ Reynolds Tobacco Plant. Because of the location of the RJR plant and increased commercial development, the projected traffic volumes on S. Main Street exceed 30,000 vehicles per day. For this reason, it is recommended that S. Main Street (King-Tobacco Road) be widen to a five (5) lane facility (with eighty feet of right-a-way) from the RJ Reynolds plant entrance to SR 1105 (Meadowbrook Drive). A five lane section at this location would increase the roads capacity by allowing through traffic movements and turning lanes each direction, while encouraging the continued flow of traffic. The land use along S. Main Street is predominately commercial, but turns into residential toward the north.

The northern segment of this thoroughfare is broken into two roads, North Main Street and Brown Road (SR 1128). Brown Road will be discussed in the next section. N. Main Street begins at Hartgrove Road and ends at Old US 52 (King Street). A 1994 average daily vehicle count on N. Main Street revealed that 5,800 vehicles were utilizing the facility each day. A 2025 future year projection based on increased housing, employment, and population yielded 12,000 vehicles traveling on this section of road each day. It is recommended that the roadway section from Hartgrove Road to King Street be widened to a 4 lane undivided section on eighty feet of right-a-way.

Brown Road (SR1128)

SR 1128 (Brown Road) is a major thoroughfare running north-south from the northernmost part of King, and connecting Chestnut Grove Road to N. Main Street mentioned in the above section. Brown Road has a roadway capacity of 10,000 vehicles per day and a future traffic projection of approximately 3,000 vehicles per day, which is more than adequate for the design year. Based on these results, there are no improvements recommended for Brown Road.

Chestnut Grove Road (SR 1136)

Chestnut Grove Road (SR 1136) serves as a major east-west route in King's northern planning area. The condition of Chestnut Grove Road is adequate for the design year. No improvements are recommended.

NC 66

NC 66 is a major thoroughfare serving the eastern part of King moving traffic in north and south directions. The roadway is adequate for the design year because of its good horizontal and vertical alignment. However, setback restrictions should be applied along this road due to the likelihood of future roadway widening. King has the potential for unexpected growth because of its geographical location just north of a growing Winston Salem. There are few direct north-south connections through King. If or when this growth occurs, NC 66 will receive a significant amount of traffic as a result of this growth.

King Street - Old US 52 (SR 1236)

Old US 52 known as King Street, is a major thoroughfare with a mixture of commercial, residential, and agricultural properties. It serves a major east-west radial in the old central business district. It is recommended that the section along King Street, beginning at King Street / Dalton Road "forked" to Mountainview Road, be widened. Currently, this section is a 2 lane road with a road capacity of 9,500 cars and a future traffic projection of almost 20,000 vehicles per day. The solution to this over capacity road lies primarily with the proposed Spainhour Extension to NC 66 project alternative and secondly with any additional roadway widening permitted (See Spainhour Extension)

Dalton Road (SR1127)

Dalton Road runs parallel to King Street (Old US 52) with Southern Railway separating the two roads. Because of residential and commercial land use and railroad land constraints, this road has an overall poor setback condition. If widened, there would be moderate proximity damage taking several residences (between 6 to 10). Moderate development is anticipated. Setback restrictions need to be considered. Relocation or closing of at-grade railroad crossings located between Main Street and Pilotview Road (See Main Street parallel facility) should also be considered.

Meadowbrook Drive (SR 1105)

Meadowbrook Drive is a major thoroughfare entering King from the southwest connecting to S. Main Street before reaching Dalton Road. Parts of Meadowbrook Drive are densely populated by resident homes with good roadway setback. The road is utilized up to 4,000 vehicles per day and has a future traffic projection of 6,500 vehicles per day. No improvements are recommended.

Mountainview Road (SR 1122)

Mountain View Road brings traffic from the northeast (outside of King) crossing over NC 66 intersecting with Hartgrove Road, Old US 52 (King Street), Spainhour Road, Jefferson Church Road, and then connecting with Moore Road and US 52. This facility is primarily residential except for commercial activity at the NC 66 and King Street intersections. The southern portion of Mountainview (below King Street) has sporadic residential development with adequate road setback. However, the northern portion has a more dense residential development with the possibility of minor proximity damage if widened. It is recommended that that Mountainview Road be up-graded to a four (4) lane facility from NC 66 to Old US 52 (E. King Street).

US 52

US 52 extends from Winston Salem through King, North Carolina carrying in 1994, almost 30,000 vehicles per day, and a roadway capacity of 54,000 vehicles per day. Future projections for US 52 yielded in excess of 65,000 vehicles per day exceeding the existing roadway capacity. Due to tremendous expected growth in Winston-Salem and in Stokes County, and unexpected affects of the new I-74 Highway on the surrounding areas, the primary facility (Main Street), connecting to the US 52 interchange, will be greatly impacted with high traffic volumes. It is for this reason, a second interchange is recommended to compliment new commercial development serving new residential development.

Trinity Church Road (SR 1106)

Trinity Church Road is a major thoroughfare serving northwest sector of King. Most of Trinity Church Road has poor setback, and is expected to move 10,400 vehicles per day in the design year. Eventually, it is recommended this facility be up-graded. Since this facility is the most likely route that would be used to disperse traffic in the northwestern part of King, an extension to the north, crossing Goff Road and Brown Road, and finally connecting with Fowler Road is recommended (See Trinity Church Road Extension). No other improvements are recommended.

Trinity Church Road Extension

It is recommended that Trinity Church Road be extended northward crossing over Goff Road and Brown Road, then finally connecting with Fowler Road. This facility would be considered as a major thoroughfare through King from northeast to southwest. Projected traffic volumes on this new location facility is expected to yield at least 3,000 vehicles per day initially. This extension has great potential for commercial activity and residential subdivision spin off. An at-grade railroad crossing will have to be constructed to complete the connecting Old US 52 and Dalton Road.

Moore Road (SR 1634)

Moore Road is a major thoroughfare extending from an inter change at US 52(Forsyth County) and connecting with Mountainview Road (Stokes County). In 1994, it carries

almost 6,000 vehicles daily, and is expected to increase due to King's growth and project planning to 8,000 to 10,000 vehicles daily.

Minor Thoroughfares

Newsome Road (SR1222) and Newsome Road Re-alignment

Newsome Road is a minor thoroughfare currently connecting Meadowbrook Road with the ramp at the US 52 / King Tobacco Road Interchange. Newsome Road serves primarily industrial development centered on the Big Oaks Industrial Park. It is recommended that Newsome Road be re-aligned through the Big Oaks Industrial Park, disconnecting from the interchange ramp at US 52. The re-alignment would connect to Big Oaks Drive across from the RJR Tobacco entranceway on the southernmost part of King Tobacco Road.

Industrial Drive Extension

Industrial Drive is a service road located south and parallel to US 52. This service is primarily used for industrial development. It is recommended that this facility be extended to meet Meadowbrook Road close to Charles Drive. The 2025 traffic projections reveal vehicles per day in excess of 3,000.

Helsabeck Road (SR 1119)

Helsabeck Road is a minor thoroughfare connecting major thoroughfares Mountainview road and NC 66. This road has scattered residential development and a large subdivision along Turkeyhill Drive. Further development is expected to continue. No improvements are recommended.

Kirby Road (SR 1115)

Kirby Road is a minor thoroughfare connecting S. Main Street to King street (Old US 52). Kirby Road is lightly populated with residences, has water and sewer available, making it outstanding for potential development. Widening would be possible with little proximity damage. It is projected that in the year 2025, Kirby Road will exceed its road capacity if traffic can not be distributed. The effects of the Spainhour extension project distributes approximately 6,000 vehicles per day away from Kirby Road, allowing this facility to continue functioning efficiently. It is recommended that Kirby Road be ultimately widened to four (4) lanes due to the potential for increased growth.

Fowler Road (SR1333, SR1134)

Fowler Road is an L-shaped minor thoroughfare serving both subdivisions and sparse residential areas between Chestnut Grove Road and NC 66. It is recommended that Fowler Road be extended westward creating the northernmost part of the Trinity Church Road Extension (See Trinity Church Road Extension). No other improvements are recommended.

Hartgrove Road (SR 1132)

Hartgrove Road is a east-west minor thoroughfare connecting Brown Road to Mountainview Road. Hartgrove Road also T-intersects with N. Main Street. This facility has a moderately dense residential population, room for further development, and adequate setback for any future widening. In its present condition, Hartgrove Road is adequate for the design year. No improvements are recommended.

Jefferson Church Road (SR 1108)

Jefferson Church Road is minor thoroughfare connecting Mountainview Road to S. Main Street (King Tobacco Road). The road has adequate setback, and is moderately populated by residences. In the 1994 base year, traffic volumes peaked at 3,100 vehicles per day. traffic projection for the future year reached almost 9,000 vehicles per day. Widening Jefferson Church Road would be expensive and damaging to area property. If unexpected traffic growth approaches the roadway capacity, it is recommended that Jefferson Church Road be eventually widened to a four (4) lane facility.

Spainhour Road (SR 1116, SR 1117)

Spainhour Road is a minor thoroughfare connecting Kirby Road and Old US 52. The western part of Spainhour is densely populated by residences nearing Kirby Road, but its residential density decreases as the road travels further east. The eastern part of Spainhour Road is occupied by one school and several churches. It is recommended that Spainhour Road be extended to NC 66 (See Spainhour Road Extension). Priddy Road is adequate for the design year.

Spainhour Extension

It recommended that Spainhour Road be extended from Old US 52 to NC 66. This road which crosses two streams would be a minor thoroughfare delivering 6,500 vehicles per day to and from their destinations. The affect of this new location facility would ease the traffic burden on four critical locations: 1)Helsabeck Road, 2)King Street / Mountainview Intersection, 3)East King Street, 4)Kirby Road / King Street Intersection, 5)Kirby Road.

Goff Road (SR 1138)

Goff Road is minor thoroughfare connects to Old US 52 and Chestnut Grove Road. This facility has scarce residential development, but will attract new traffic due to the construction of a New High school. The road has good setback, but poor horizontal and vertical alignment. Goff Road is adequate for the design year. No improvements are recommended.

Priddy Road (SR 1137) and Priddy Road Extension

Priddy Road is a minor thoroughfare connecting Goff Road and Chestnut Grove Road. This road has poor horizontal and vertical alignment, with little residential development, but good setback. Priddy Road is adequate for the design year. No improvements are recommended.

Butner Road (SR 1607)

Butner Road is a minor thoroughfare and low design facility. It connects Spainhour Mill Road (Forsyth County) to Meadowbrook Drive (Stokes County). There is a one lane bridge over a creek bed from bank to bank. The facility is surrounded by woodlands, and secluded residential homes. Traffic volumes on this road are extremely low; therefore, and no improvements are recommended.

Minor Improvements

The following are minor road improvements suggested by the City of King for the purpose of promoting safer and more efficient vehicle travel.

Inside City Limits:

- 1. Kirby Road East and King Street**
 - Left turn needed from Kirby Road onto East King Street to reduce the backup of vehicles over the rail road crossing.
 - Traffic signal needed to moderate traffic flow.
- 2. Helsabeck Road @ Mountainview**
 - Left turn lane needed from Helsabeck onto Mountainview Road to reduce vehicle - stacking.
 - traffic signal needed to moderate traffic flow.
- 3. Kirby @ Spainhour Road**
 - Left turn lane needed from Spainhour Road onto Kirby Road to reduce vehicle stacking.
 - possible re-alignment needed at the intersection.
- 4. Logan Court @ Moore Road**
 - Right turn lane needed from Moore Road onto Logan Court to reduce the potential rear-end collisions.
- 5. Spainhour Road @ Moore Road**
 - Replacement of four-way stop signs with traffic signals to encourage continual traffic flow on Moore Road.
- 6. Ingram Road @ Meadowbrook Drive**
 - Realignment of Ingram Drive and Plantation Drive at Meadowbrook Road intersection to reduce unsafe diagonal turning movements

Outside City Limits:

- 1. Goff Road@ West King Street**
 - Left turn lane from Goff Road onto West King Street due to increase traffic from construction of new high school.
 - Study entire intersection of West King, Goff Road and West Dalton Road due to rail road crossing, offset alignment, and increased traffic volume of school traffic.
 - Reduce speed limit on West King Street from 55 mph to 45 mph because of congestion at intersection and limited sight distances at rail road crossing.
- 2. Mountainview Road @ NC 66**
 - Multiple turn lanes and protected phase signal needed at Mountainview Road and NC 66 to reduce vehicle stacking.

3. Crooked Run Creek Bridge @ Goff Road

- Bridge widening and raised elevation needed a 1,000 feet south of Priddy Road intersection due to the increase traffic of a new high school and excessive flooding.

4. East Hartgrove @ Mountainview Road

- wider turning radius needed at Hartgrove onto Mountainview to eliminate sharp angle turns



KING

RECOMMENDED THOROUGHFARE PLAN

Legend
Existing Proposed

MAJOR THOROUGHFARE

MINOR THOROUGHFARE

INTERCHANGE

GRADE SEPARATION

Adopted by:

City of King

December 7, 1998

Recommended Approval
by Statewide Planning Branch

December 14, 1998

North Carolina
Department of Transportation

1-8-99

FIGURE 2



KING

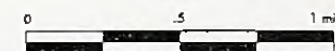
STOKES COUNTY

NORTH CAROLINA

PREPARED BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH THE
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE



BASE MAP: SEPTEMBER 20, 1994

Chapter 3

Implementation of the Thoroughfare Plan

Once the thoroughfare plan has been developed and adopted, implementation is one of the most important aspects of the transportation plan process. Unless implemented, the effort and expense associated with developing the plan is lost. There are several tools available for use by the City of King to assist in the implementation of the thoroughfare plan. They are described in detail in this Chapter.

State-Municipal Adoption of the Thoroughfare Plan

The City of King and the North Carolina Department of Transportation have mutually approved the thoroughfare plan shown in Figure 2. This mutually approved plan serves as a guide for the Department of Transportation in the development of the road and highway system for the City of King. The approval of the plan by the City of King enables standard road regulations and land use controls to be used effectively in the implementation process of this plan. As a part of the plan, the City of King and the Department of Transportation shall reach an agreement on the responsibility for existing and proposed streets and highways. Facilities that are designated as municipal responsibility will be constructed and maintained by the municipality.

Subdivision Controls

Subdivision regulations require every subdivision to submit to the City Planning Board a plan of any proposed subdivision. It also requires that subdivisions be constructed to certain standards. Through this process, it is possible to require the subdivision streets to conform to the thoroughfare plan and to protect right-of-way for projected roads and highways that are part of the thoroughfare plan. The construction of subdivision streets to adequate standards reduces maintenance costs and simplifies the transfer of streets to the State Highway System. Appendix D outlines the recommended subdivision design standards as they pertain to road construction.

Land Use Controls

Land use regulations are an important tool in that they regulate future land development and minimize undesirable development along roads and highways. The land use regulatory system can improve highway safety by requiring sufficient setbacks to provide for adequate sight distances and by requiring off-street parking. Reverse frontage that encourages houses to face toward local streets, not thoroughfares, should also be encouraged.

Development Reviews

Driveway access to a state-maintained street or highway is reviewed by the District Engineer's office and by the Traffic Engineering Branch of the North Carolina Department of Transportation. In addition, any development expected to generate large volumes of traffic (e.g., shopping centers, fast food restaurants, or large industries) may be comprehensively studied by staff from the Traffic Engineering Branch, Planning and Environmental Branch and/or Roadway Design Unit of NCDOT. If done at an early stage, it is often possible to significantly improve the development's accessibility while preserving the integrity of the thoroughfare plan.

Funding Sources

Capital Improvements Program

A Capital improvement program makes it easier to build a planned thoroughfare system. A capital improvement program consists of two lists of projects. The first is a list of highway projects that are designated as a municipal responsibility and are to be implemented with municipal funds. The second is a list local projects designated as State responsibility to be included in the Transportation Improvement Program.

Transportation Improvement Program

North Carolina's Transportation Improvement Program (TIP) is document that lists all major construction projects the Department of Transportation plans for the next seven years. Similar to the local Capital Improvement Program projects, TIP projects are matched with projected funding sources. Every two years when TIP is updated, completed projects are removed, programmed projects are advanced, and new projects are added.

During the biannual TIP public hearings, municipalities request projects to be included in the TIP. A Board of Transportation member reviews all of the projects requests in a particular area of the state. Based on the technical feasibility, need, and available funding, the board member decides which projects will included in the TIP. In addition to highway construction and widening, TIP funds are available for bridge replacement projects, highway safety projects, public transit projects, railroad projects, and bicycle projects.

Industrial Access Funds

If an industry wishes to develop property that does have access to a state maintained highway and certain economic conditions are met, then fund may be available for construction of an access road.

Small Urban Funds

Small urban funds are annual discretionary funds made to municipalities with qualifying projects. The maximum amount is \$100,000 per year per division. A city may have multiple projects. Requests for Small Urban Fund assistance should be directed to the appropriate Board of Transportation member and Division Engineer.

The North Carolina Highway Trust Fund Law

The Highway Trust Fund Law was established in 1989 as a plan with four major goals for North Carolina's roads and highways. These goals are:

1. To complete the remaining, 1,716 miles of four lane construction on the 3,600 mile North Carolina Intrastate System.
2. To construction a multilane connector in Asheville and portions of multilane loops in Charlotte, Durham, Greensboro, Raleigh, Wilmington, and Winston-Salem.
3. To supplement the secondary road appropriation in order to pave, by 1999, 10,000 miles of unpaved secondary roads carrying 50 or more vehicles per day, and all other unpaved secondary roads by 2006.
4. To supplement the Powell Bill Program.

The portion of this bill which will benefit King, over the thirty year planning period, is the paving of most, if not all, of its unpaved roads on the State maintained system. Also, there will be an increase in King Powell Bill Funds if these newly paved roads are in the King Corporate limits. For more information on the Highway trust Fund Law, contact Program development Branch of the North Carolina department of Transportation.

Implementation Recommendations

The following table provides a break down of the projects recommended in the King Thoroughfare Plan and the corresponding method that would best suit the implementation of the given project.

Table 1

Funding Sources and Methods Recommended for Project Implementation

Projects	Local Funds	TIP Funds	Industrial Access	Small Urban	T-fare Plan	Suddiv . Ord.	Zoning Ord.	Review
Main St. R-2201	☐	☒	☒	☐	☒	☐	☐	☐
Spainhour Ext.	☒	☒	☐	☒	☒	☒	☒	☒
Pilot View Rd Ext.	☒	☒	☐	☒	☒	☐	☐	☐
Trinity Rd Interchange	☐	☒	☐	☐	☒	☐	☐	☐
Trinity Road Ext.	☒	☒	☐	☐	☒	☒	☐	☐
Industrial Drive Ext.	☒	☒	☐	☐	☒	☐	☒	☐

Construction Priorities and Cost Estimates

Construction priorities will vary depending on what criteria are considered and what weight is attached to the various criteria. Most people would agree that improvements to the major thoroughfare system and major traffic routes would be more important than minor thoroughfares where traffic volumes are lower. To be in the North Carolina Transportation Improvement Program, a project must show favorable benefits relative to costs and should not be prohibitively disruptive to the environment. The potential cost estimate of King recommended projects with respect to the user benefits, and probabilities that economic development will be stimulated and environment impact will be minimized are given in Table 3. A guide to this table is shown in Table 2

Table 2
Probability Estimation Guide

Subjective Evaluation	Impact Probability
Excellent - very substantial	1.00
Very good -substantial	0.75
Good-considerable	0.50
Fair-some	0.25
Poor-none	0.00

(Final Evaluations will made on the above table)

Table 3
Transportation Benefits Evaluation of Major Projects

Projects	Benefits (millions)	Costs (millions)	Length mi. (km)	Benefits \km	Economic Development	Environ. Impact
Main Street	\$ 2.3	12.259	1.68 (17.2)	4.6	1.00	.25
Spainhour ext	\$ 12.1	5.7	1.17 (7.9)	3.0	.50	.75
Pilot Street	\$ 4.8	9.1	1.86 (43.5)	3.1	.25	.25
Trinity Road Interchange	\$ 1.1				.75	0.00
Trinity Church Road	\$ 1.7	13.216	2.8 (5.0)	2.8	.25	1.00
Industrial Drive ext	\$ 0.6	3.4944	0.91 (0.8)	2.4	1.00	.25

(Final Evaluations will made on the above table)

Table 4
Potential Project Cost Estimates

Project Description	Construction Cost	Right-of-way Cost	Total Cost
1. Programmed project only (widening of Main St.) - R-2201	8.995	3.264	12.259
2. Spainhour Extension to NC66	4.104	1.596	5.7
3. Pilot View Road Extension (from Ingram Drive to Brown Road)	6.552	2.548	9.1
4. US 52 - Trinity Road Interchange			
5. Trinity Road extension	9.51552	3.70048	13.216
6. Industrial Drive Extension (parallel to US52) to Meadowbrook	2.515968	0.978432	3.4944

(Final Evaluations will made on the above table)

Chapter 4

Roadway System Analysis

This chapter presents an analysis of the existing street system to serve the area's travel desires. Emphasis is placed not only on detecting the deficiencies, but on understanding their cause. Travel deficiencies may be localized and the result of substandard highway design, inadequate pavement width, or intersection controls. Alternately, the underlying problem may be caused by a system deficiency such as a need for a bypass, loop facility, construction of missing links, or additional radials.

Existing Road System

While there is still room for future road construction, a large portion of King's road system is already constructed. An analysis of the existing road system gives insight into how the existing system was formed and forces that might influence future construction. Early road construction was strongly influenced by the presence of the railroad. This resulted in the construction of Old US52 (King Street) and Dalton Road which parallel and adjacent to either side of the railroad. This system is common in many cities in North Carolina and allowed for development on both sides of the railroad. Much of the road system is the result of paving early State secondary roads and development roads that were connected to these roads. This trend continues today. In addition to this, the construction of US 52 in the late 1950s had a major impact on the layout and connectivity of the road system around King. Although US 52 brought high speeds travel to Stokes County, its accessibility to King via two interchanges at Main Street and Moore Road was limited. The only other major route in the area is NC 66. NC 66 connects northern parts of Forsyth County with several small cities in Stokes County and eventually intersects NC 89. US 52, however has more regional significance by connecting Winston-Salem to Mount Airy and will connect to I-77 (a high-speed facility) by year 2000. It is also planned to carry the I-74 designation when the connection to I-77 is complete. Some of the interchanges on US 52 do not meet Interstate Road standards and some upgrading will need to be done. The programmed widening on Main Street will address this issue as well as the concerns regarding Newsome Road. Because much the existing road system was built by developers, the many roads lack connectivity and continuity in lane widths and traffic flow. These are all issues that need to be considered in updating the previous Thoroughfare Plan.

Existing Travel Patterns

Travel is largely influenced by US 52, interchange locations, Winston-Salem to the south and large employers in the area.. These include R. J. Reynolds on South Main Street, Calvary Baptist Bible College, The New Fortis Corporation, The Hastings Company and several schools and retirement homes.

KING

1994 Traffic Counts and Roadway Capacities

LEGEND

XXXX 1994 ADT VOLUMES

XXXX EXISTING ROAD CAPACITY

NEAR CAPACITY
(V/C = .75 - 1.00)

OVERCAPACITY
(V/C > 1.0)

FIGURE 3



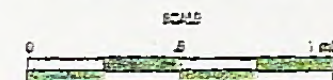
KING

STOKES COUNTY

NORTH CAROLINA

BY THE
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATISTICAL PLANNING DIVISION

IN PARTIAL FULFILLMENT OF
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION



DATE: 1994 SEPTEMBER 20, 1994



KING

2025 Future Year Deficiencies

ALTERNATIVE 3:
PROPOSED ALTERNATIVES

LEGEND

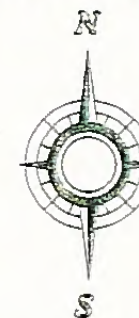
XXXX 1994 ADT VOLUMES
 XXXX 2025 ADT VOLUMES
 XXXX EXISTING ROAD CAPACITY

NEAR CAPACITY
 (VC = 0.85 - 1.00)

OVER CAPACITY
 (VC > 1.0)

PRIMARY ALTERNATIVES

FIGURE 4



KING

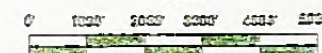
STOKES COUNTY

NORTH CAROLINA

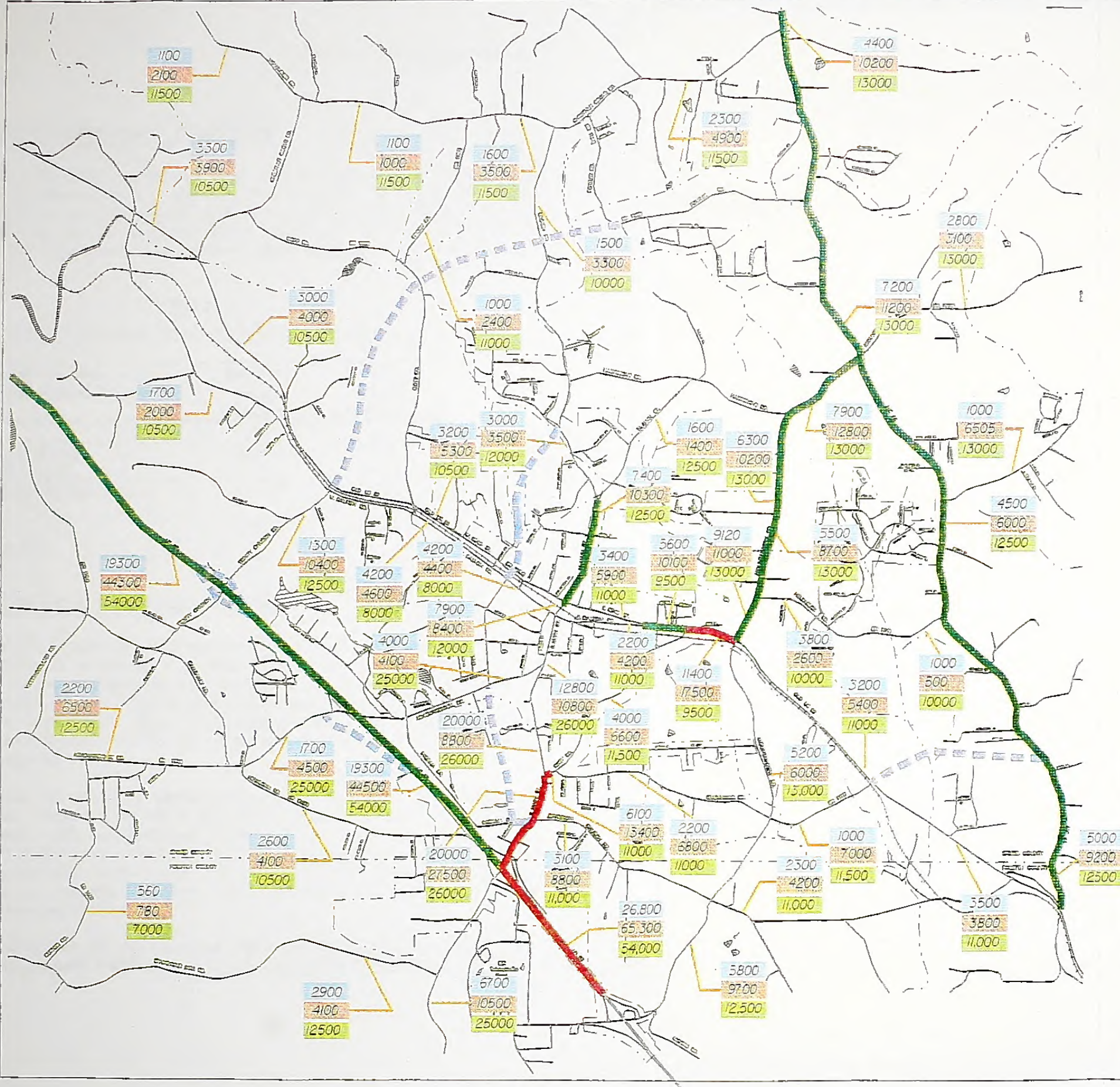
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 STATISTICS PLANNING BRANCH

U.S. DEPARTMENT OF TRANSPORTATION
 FEDERAL HIGHWAY ADMINISTRATION

SCALE



BASE MAP: SEPTEMBER 20, 1994



1994 Capacity/Deficiency Analysis

Figure 3 shows the 1994 gathered data on existing roadway capacities and average daily traffic counts for all relevant roads in the King planning area. Figure 3, also shows roadway deficiencies (red and green sections) which correspond to existing capacities and 1994 traffic volumes for only the congested facilities shown in Table 5. Red and green roadway sections are determined to be deficient when the existing traffic exceeds the roadway capacity.

Table 5
1994 Congested Roads and Traffic Volumes

Congested Roadway Facility(location between)	Existing Daily Capacity	Existing Traffic Volumes
Main Street (Kirby - Meadowbrook)	14,000	20,000
Main Street (Meadowbrook - Dalton)	12,000	12,800
King Street(Kirby-Mountainview)	9,500	11,400

2025 Capacity/Deficiency Analysis

In Figure 4, roadway capacities and anticipated daily traffic volumes are shown. Red and green roadway sections are determined to be deficient when the future traffic exceeds the roadway capacity. Also, comparisons can be made between the 1994 traffic counts and the 2025 anticipated traffic. A large portion of the King's transportation system performance is based on volume capacity analysis, however; the computer model is a simulation of traffic paths and recommendations must be scrutinized using local knowledge of travel patterns and engineering judgment.

Table 6 below shows the change in traffic volumes as the No Build, TIP Build, and Recommended build alternatives applied to King area transportation system. No Build indicates anticipated traffic on congested facilities if no construction projects are implemented. TIP Build shows anticipated traffic on congested facilities only if current Transportation Improvement Projects were constructed. Recommended Build indicates anticipated traffic on congested facilities after all recommended projects on the thoroughfare have been constructed.

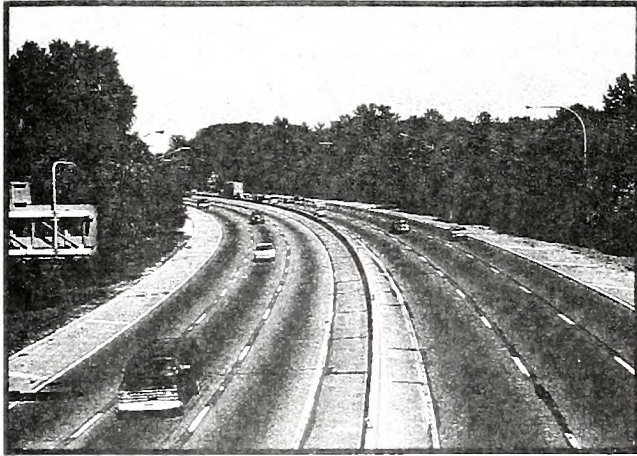
Table 7 shows the all of the major recommended construction alternatives, the facility type, and the 2025 anticipated daily traffic volumes that would use this facility in the future.

Table 6
Estimated 2025 Traffic Volumes on Existing Facilities

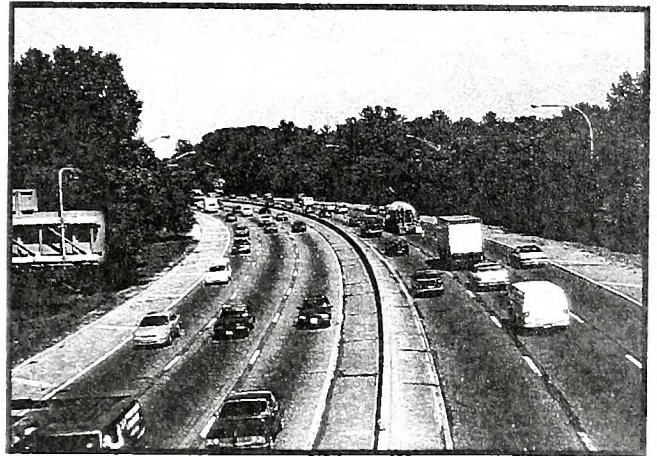
Congested Roadway Facilities	No Build	TIP Build	Recommended Build
Main Street (US 52 - Kirby)	33000	33000	32000
Main Street (Kirby - Meadowbrook)	12500	12500	8800
Main Street (Meadowbrook - Dalton)	16800	16800	10800
Main Street (King - Brown)	12000	12000	10300
Kirby Road (Main - Spainhour)	16400	16400	13400
Kirby Road (Spainhour - King)	11500	11500	6600
King Street(Dalton - Mountainview)	19800	19800	17500
Mountainview Road (King - Helsabeck)	18200	18200	11000
Mountainview Road (Helsabeck - Hartgrove)	12500	12500	10200
Mountainview Road (Hartgrove - NC 66)	14700	14700	12800
NC 66 (Old US 52 - Mountainview)	10000	10000	9000
NC 66 (Mountainview - Chestnut)	12400	12400	11200

Table 7
Estimated 2025 Traffic Volumes on Recommended Alternatives

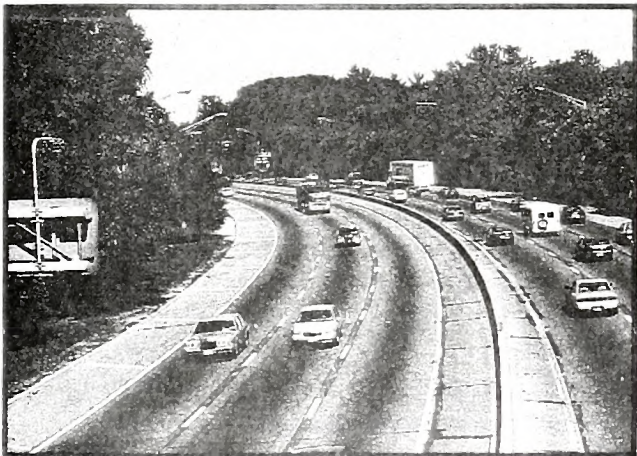
Recommended Alternatives	Facility Type	Anticipated Daily Traffic
1. Programmed project only (widening of Main St.) - R-2201	Multi- Lane Undivided	17,000
2. Spainhour Extension to NC66	2 Lane Undivided	6,000 to 7,000
3. Pilot View Road Extension (from Ingram Drive to Brown Road)	2 Lane Undivided	8,000 to 9,000
4. US 52 - Trinity Road Interchange	Interchange	2,000 to 3,000
5. Trinity Road extension	2 Lane Undivided	3,000 to 4,000
6. Industrial Drive Extension (parallel to US52) to Meadowbrook	2 Lane Undivided	2,000 to 3,000



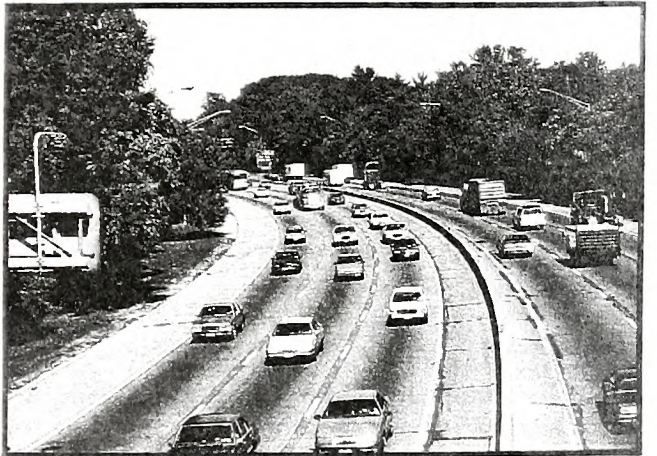
LOS A.



LOS D.



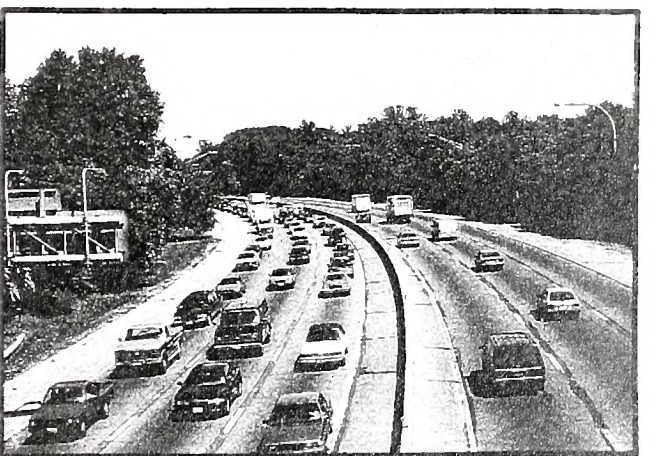
LOS B.



LOS E.



LOS C.



LOS F.

FIGURE 5

LEVELS OF SERVICE

Level Of Service

A good indication of the adequacy of the existing major street system is a comparison of the traffic volumes with the ability of the streets to move traffic freely at a desirable speed. The amount of traffic that can travel on a street is controlled principally by the spacing of major traffic control devices along the road. Thus, the ability of a street to move traffic can be increased by restricting parking and turning movements, using proper sign and signal devices, and by the application of other traffic engineering techniques.

Vehicle capacity represents the maximum number of vehicles that can pass a given point during a specified period under prevailing roadway, traffic, and control conditions. Person capacity represents the maximum number of people that can pass a given point during a specified period under prevailing conditions. Person capacity is commonly used in evaluating public transit services, high-occupancy vehicle lanes, or pedestrian facilities. The following vehicle capacity definitions are taken from the Highway Capacity Manual, Special Report 209, Third Edition, 1994, p. 1-4. Six levels of service have been selected to identify the conditions existing under various speed and volume conditions on a highway or street. The six levels of service, as shown in Figure 5, are:

1. Level-of-service A represents free flow. Individual users are virtually unaffected by the presence of others in the traffic stream. Freedom to select desired speeds and to maneuver within the traffic stream is extremely high. The general level of comfort and convenience provided to the motorist, passenger, or pedestrian is excellent.

2. Level-of-service B is in the range of stable flow, but the presence of other users in the traffic stream begins to be noticeable. Freedom to select desired speeds is relatively unaffected, but there is a slight decline in the freedom to maneuver within the traffic stream from LOS A, because the presence of others in the traffic stream begins to affect individual behavior.

3. Level-of-service C is in the range of stable flow, but speeds and maneuverability are more closely controlled by higher volumes. Most of the drivers are restricted in their freedom to select their own speed, change lanes, or pass. A relatively satisfactory operating speed is still obtained with service volumes perhaps suitable for urban design practice.

4. Level-of-service D represents unstable flow, with tolerable operating speeds being maintained though considerably affected by changes in operating conditions. Fluctuations in volume and temporary restrictions to flow may cause substantial drops in operating speeds. Drivers have little freedom to maneuver, and comfort and convenience are low. However, these conditions can be tolerated for short periods of time.

5. Level-of-service E represents operating conditions at or near the capacity level. All speeds are reduced to a low, but relatively uniform value. Maneuver within the traffic stream is extremely difficult, and it is generally accomplished by forcing a vehicle or pedestrian to "give way" to accommodate such maneuvers. Flow is unstable, and there may be stoppages of momentary duration.

6. Level-of-service F is used to define forced or breakdown flow. This condition exists wherever the amount of traffic approaching a point exceeds the amount which can traverse the point. Queues form behind such locations. Operations within the queue are characterized by stop-and-go waves, and they are extremely unstable. Vehicles may progress at reasonable speeds for several hundred feet or more, then be required to stop in a cyclic fashion. Level-of-service F is used to describe the operating conditions

within the queue, as well as the point of the breakdown. In many cases operating conditions of vehicles or pedestrians discharged from the queue may be quite good. It is the point at which arrival flow exceeds discharge flow which causes the queue to form. Level-of-service F is an appropriate designation for such points.

The recommended improvements and overall design of the Thoroughfare Plan were based on achieving a minimum of LOS D on existing facilities, and LOS C on new facilities. LOS D is considered the "**practical capacity**" of a facility, or that point at which the public begins to express dissatisfaction.

It should be noted, however, that the above levels-of-service are general definitions. For each type of facility, levels-of- service are defined on the basis of one or more operational parameters that best describe the operating quality for the facility type. The parameters selected to define levels-of- service for each facility type are called measures of effectiveness and represent available measures that best describe the operation on the subject facility. The following table presents the primary measures of effectiveness used to define level-of-service for each facility type. Effectiveness and level- of-service criteria are not defined for bicycles. The treatment of bicycles is limited to their impact on other vehicular flow at critical points in the street and highway system.

*Highway Capacity Manual, Special Report 209, Third Edition, 1994, p.1-5

Chapter 5

Population, Employment, Land Use, and Traffic (Factors Affecting the Future Roadway System)

The objective of thoroughfare planning is to develop a transportation system that will meet future travel demand and enable people and goods to travel safely and economically. To determine the needs of an area it is important to understand the role that population, economics and land use have in the long range transportation planning process.

In order to formulate an adequate 2025 thoroughfare plan, reliable forecasts of future travel characteristics must be achieved. A future year forecast beyond twenty years is needed to give traffic forecasts for individual road projects. They require a traffic estimate twenty years from the date construction is expected to be complete. In addition to this, thoroughfare plan updates often only occurs every eight to ten years, which can reduce the adequacy of the future traffic projection to meet the twenty-year requirement. The factors of population, vehicle usage trends, economy and land use play a significant role in determining the transportation needs of the area and must be carefully analyzed. Additional items may include the effects of legal controls such as subdivision regulations and zoning ordinances, availability of public utilities and physical features of the area.

The first step in the development of the thoroughfare plan is to define the planning period and the planning area. The planning period is typically on the order of 25 years. The base year for the King study was 1994, however projections were not done until 1997, therefore a design year of 2025 was used. The planning area is generally the area that is expected to have urban density characteristics in the design year. Urban density, as defined by the Bureau of Census, is anything greater than 1000 people per square mile. The planning area is divided into traffic analysis zones for the purpose of projecting land use and the travel it produces. The planning area for King is shown in Figure 7.

Population

The amount of traffic on a section of roadway is a function of the size and location of the population it serves. Investigating past trends in population growth and forecasting future population growth and dispersion is one of the first steps for a transportation planner. Table 8 shows the historical and projected population trends for King through 2025. A graphical representation of historical and projected population trends is shown in Figure 6.

POPULATION TRENDS & PROJECTIONS

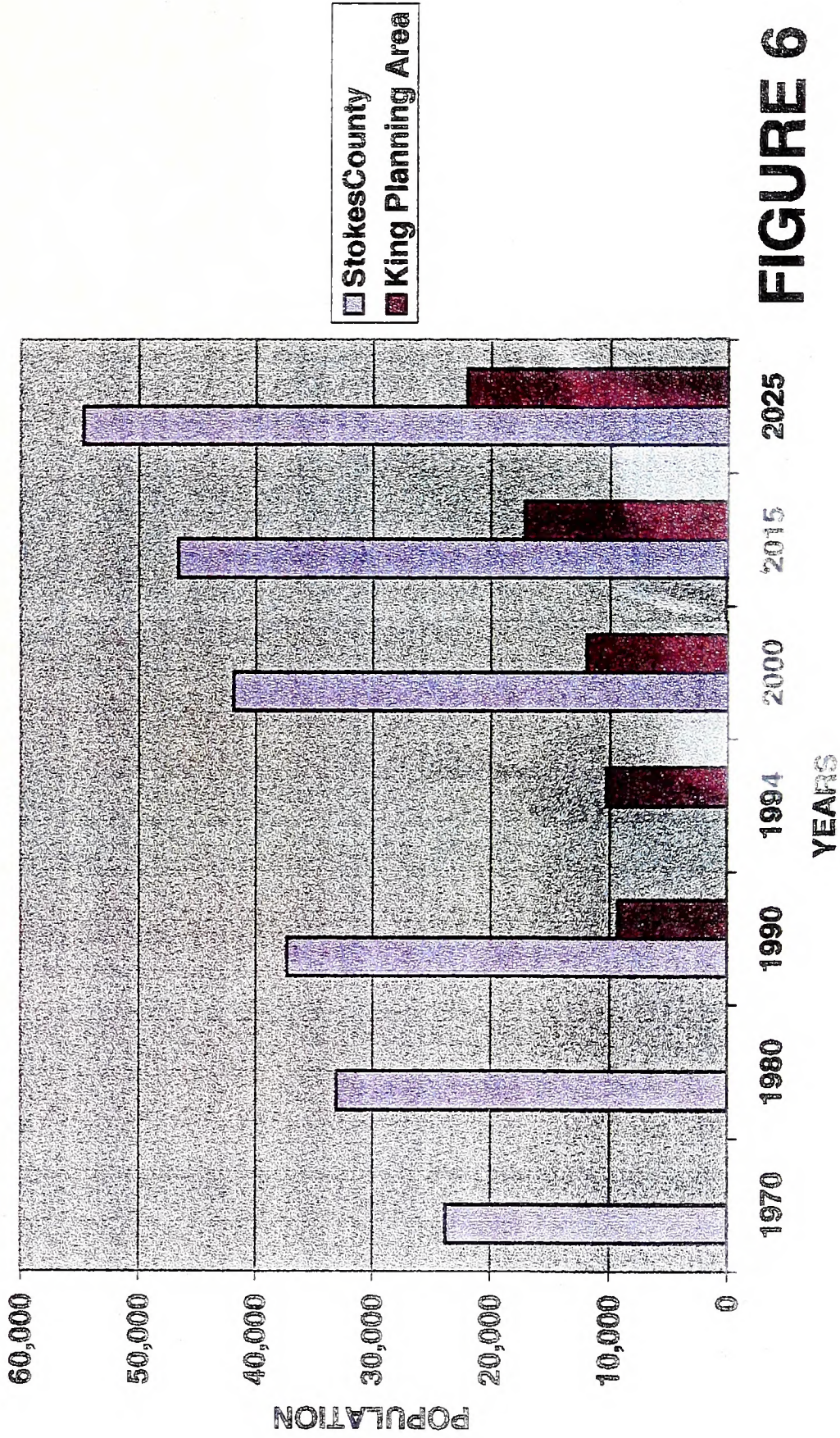


FIGURE 6

KING PLANNING AREA ZONE MAP

XX ZONE NUMBER
—— ZONE BOUNDARY

FIGURE 7



KING

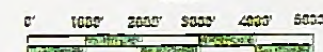
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NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING DIVISION

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE



BASE MAP: SEPTEMBER 20, 1994

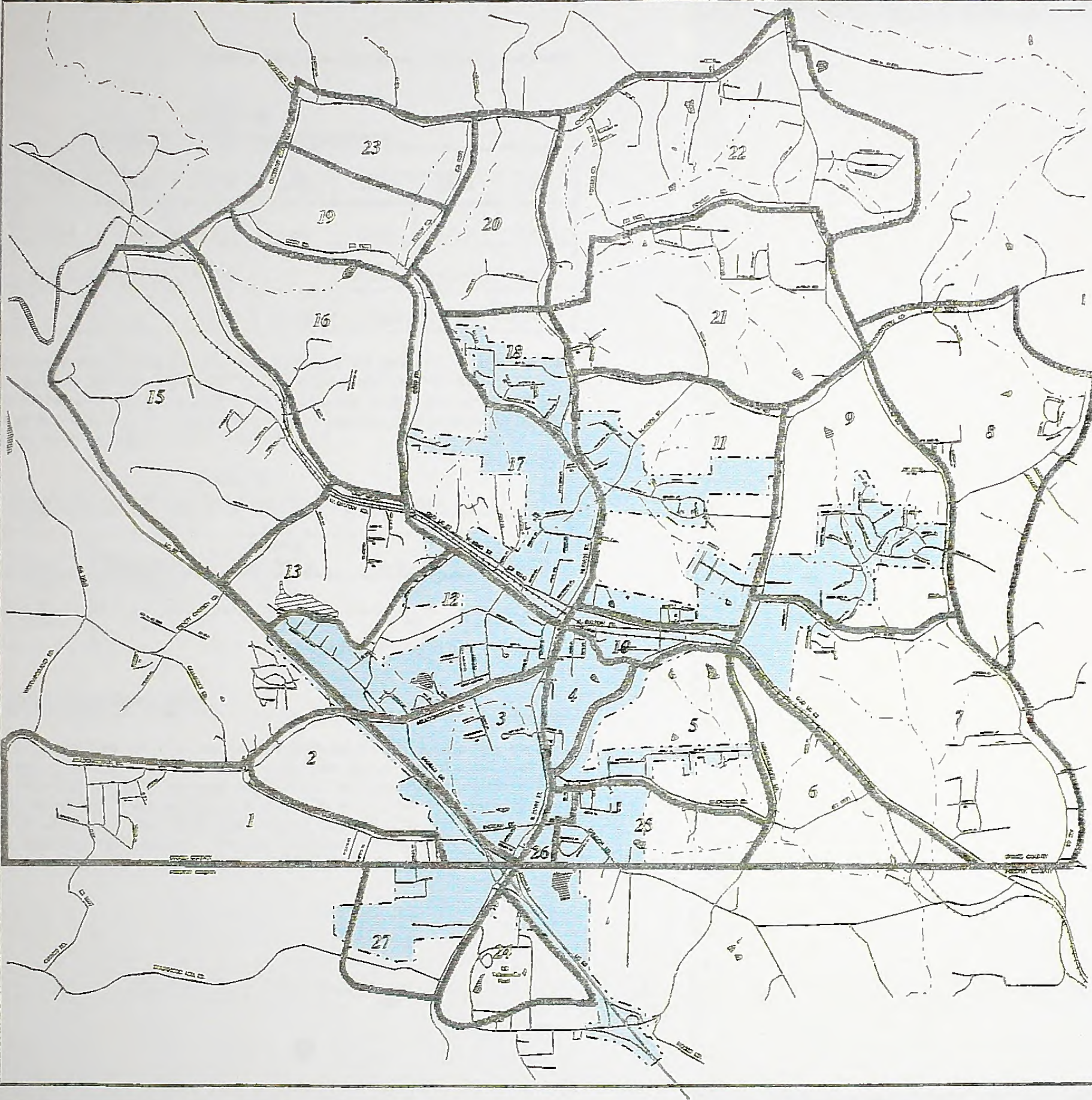


Table 8
Population Trends and Projections

Area	1970	1980	1990	1994	2000	2015	2025
State (in millions)	5.084	5.880	6.632	7.194	7.713	8.543	9.346
Stokes County	23,782	33,086	37,223	-	41,846	46,546	54,623
King Planning Area	-	-	9,270	10,223	11,900	17,200	21,980

These projections represent historic trends, with more weight given to County trends because their projections are not influenced by annexation aberrations. Planning Area population for 1994 was derived by counting all dwelling units in the area and applying a 1990 Census occupancy rate of 2.60. Using these trends, dwelling unit projections for the Planning Area were made as shown in Table 9 and Figure 9.

Table 9
Dwelling Unit Projections for the Planning Area

Year	Population	King Planning	Housing
1994	10,223	2.60	3,938
2025	21,980	2.51	8,756

Economy and Employment

While an analysis of dwelling units for an area contributes greatly to the trip making potential of an area, economic vitality and employment are also an important part of the travel analysis. Number of employees, type employment, employee income and vehicle ownership explain much of the trip making characteristics of an area. Employee income and vehicle are usually highly correlated with housing quality. Type employment also varies in its trip making characteristics. For the purposes of travel demand modeling, employment is usually broken down into five major classifications as shown in Table 10.

KING

2025

PLANNING AREA LANDUSE MAP



FIGURE 8



KING

STOKES COUNTY

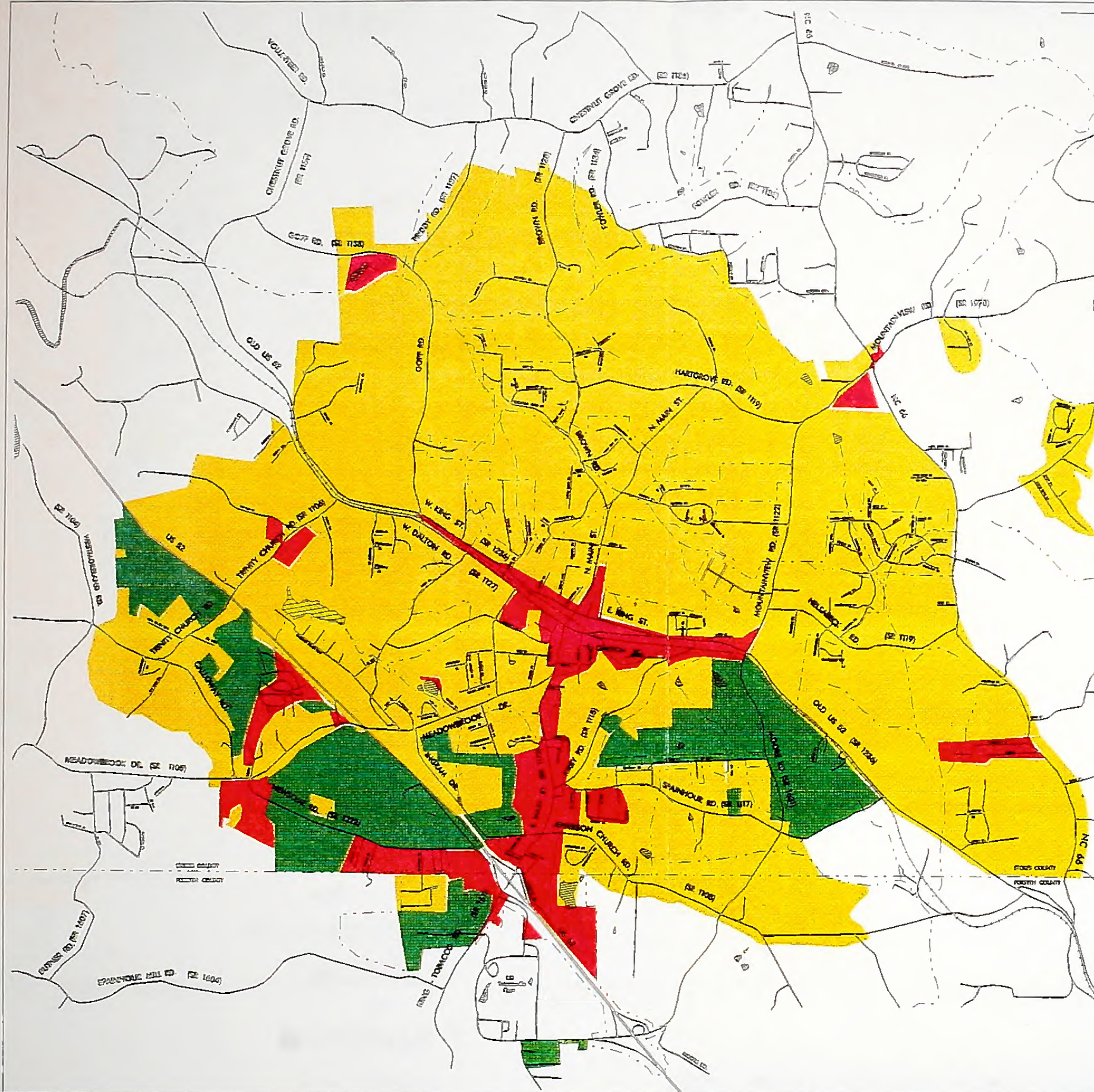
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DATE MAP SEPTEMBER 20, 1994



KING

HOUSING DATA

LEGEND

- XX 1994 HOUSING
- XX 2025 HOUSING
- ZONE NUMBER
- ZONE BOUNDARY

FIGURE 9



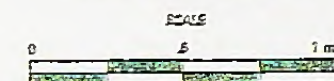
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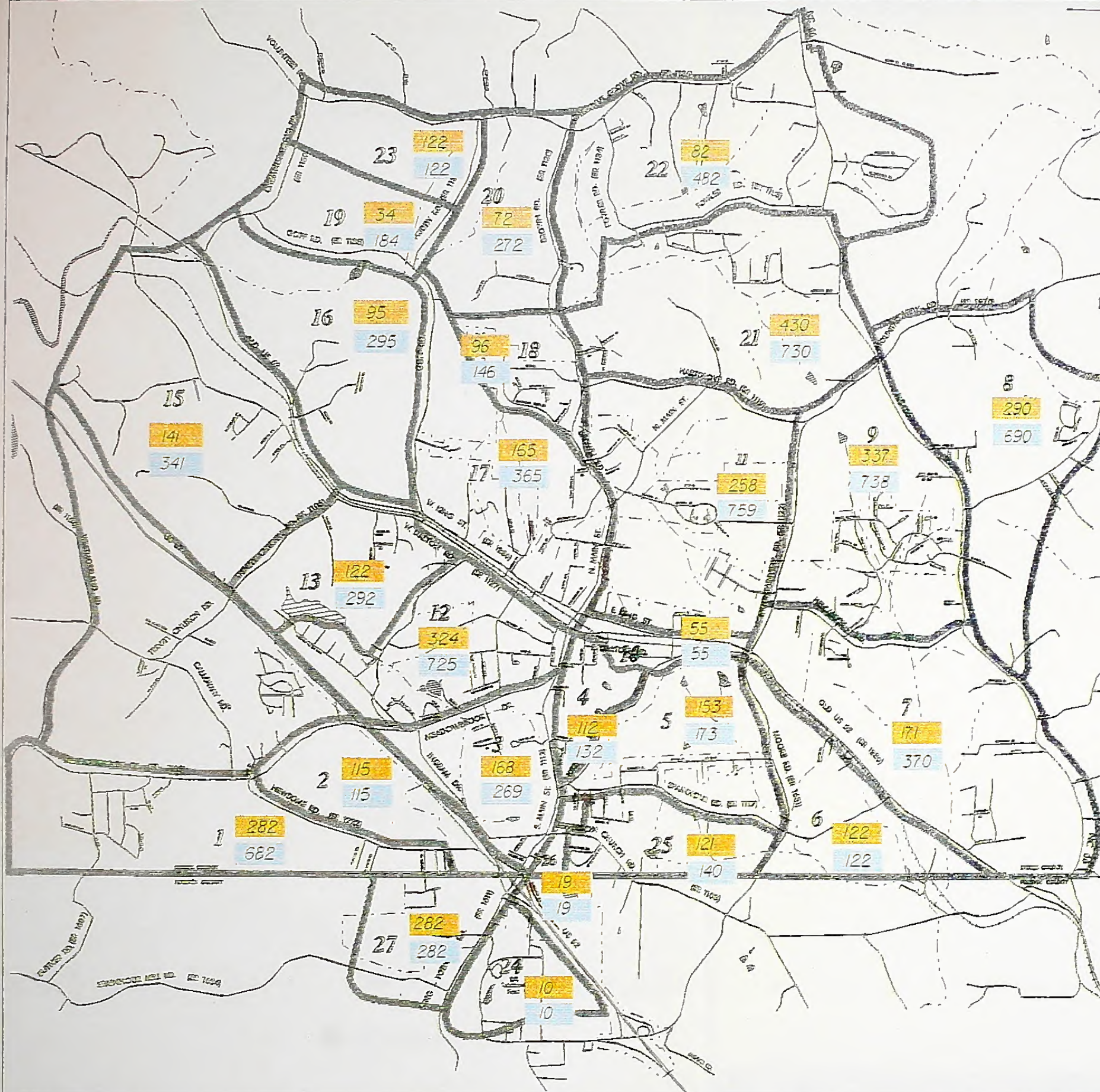
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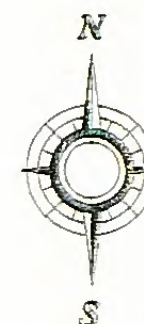
KING

EMPLOYMENT DATA

LEGEND

- XX 1994 EMPLOYMENT
- XX 2025 EMPLOYMENT
- ZONE NUMBER
- ZONE BOUNDARY

FIGURE 10



KING

STOKES COUNTY

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SCALE

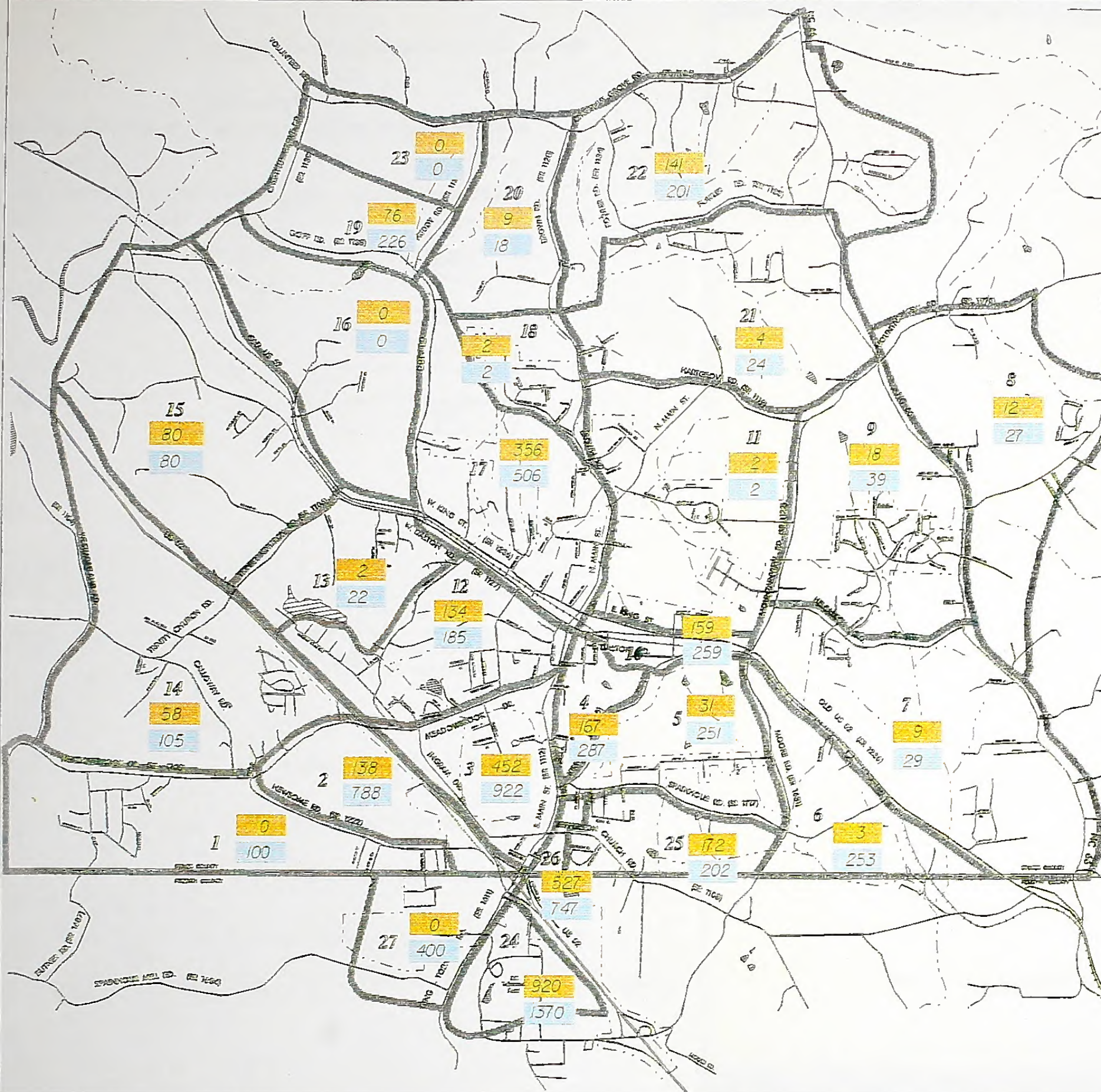


Table 10
Employment Distribution for the King Planning Area

Type of Employment	1994 Employment	2025 Employment
Industrial	1,140	2,460
Retail	603	1,234
Highway Retail	160	418
Office	580	950
Service	989	1,983
Total	3,472	7,045

Land Use

Land use refers to the physical patterns of activities and functions within a city or county. Nearly all traffic problems in a given area can be attributed in some form to the type of land use. For example, a large industrial plant might be the cause of congestion during shift change hours as its workers come and go. However, during the remainder of the day few problems, if any, may occur. The spatial distribution of different types of land use is the predominant determinant of when, where and why congestion occurs. The attraction between different land uses and their association with travel varies depending on the size, type, intensity and spatial separation of each.

For use in transportation planning, land uses are grouped into four categories:

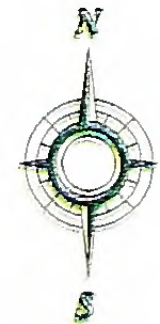
1. Residential - all land devoted to the housing of people (excludes hotels and motels)
2. Commercial - all land devoted to retail trade including consumer and business services and offices
3. Industrial - all land devoted to manufacturing, storage, warehousing and transportation of products
4. Public - all land devoted to social, religious, educational, cultural and political activities.

Figure 8 shows the planning area's existing land use.

KING HIGH VEHICLE CRASH LOCATION MAP

- 1992-1996 HIGH CRASH LOCATIONS
- POTENTIALLY HIGH CRASH LOCATIONS
- LOCATION DESCRIPTION

FIGURE 11



KING

STOKES COUNTY

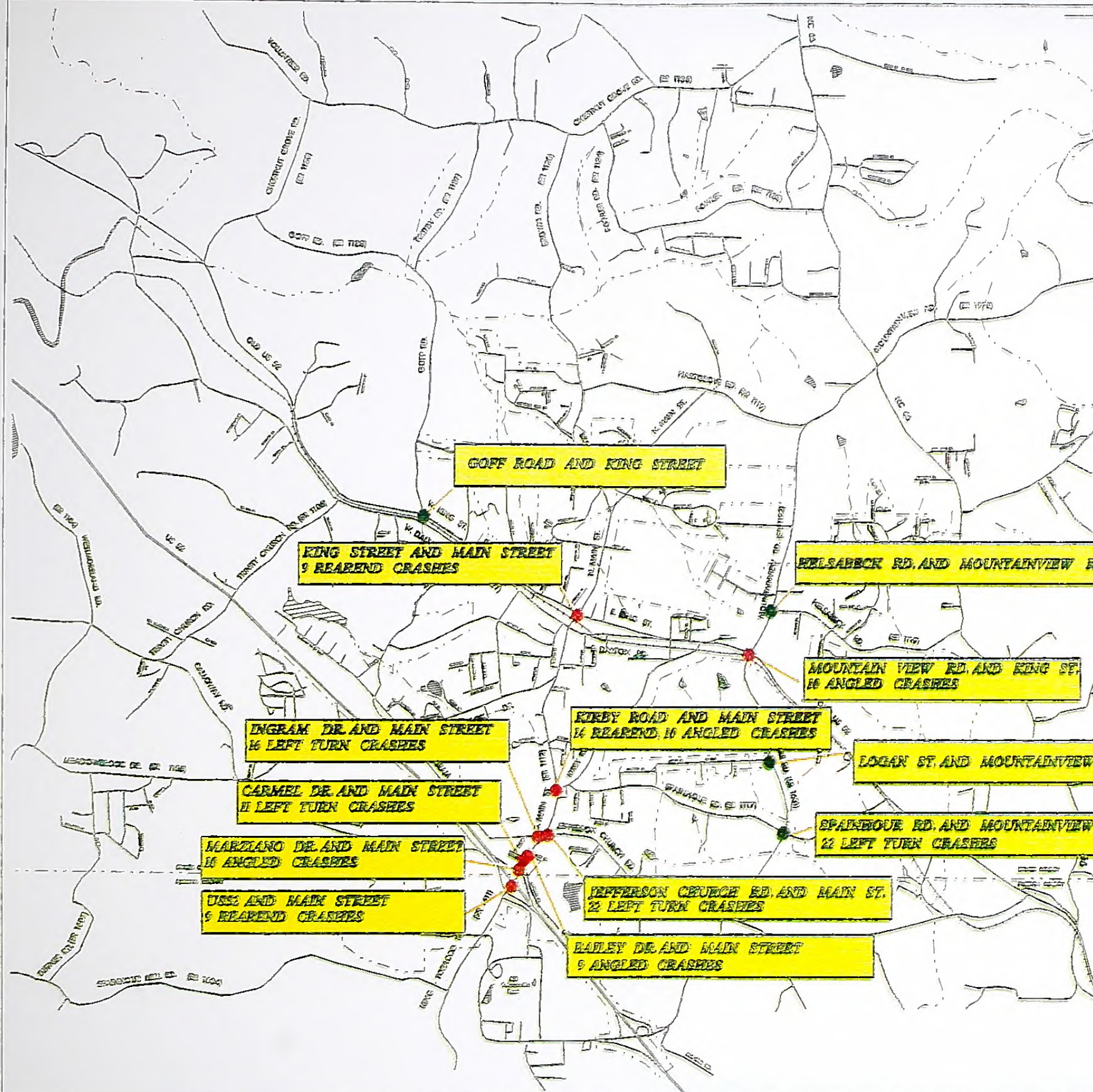
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RAIMOND PARRIS, CIVIL ENGINEER

IN COOPERATION WITH
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
IDEAL HIGHWAY ADMINISTRATION



DATE: 1997 SEPTEMBER 20, 1994



Traffic Accidents Analysis

The following table shows high accident locations identified using data from the North Carolina Department of Transportation's database between 1993 and 1996. Shown in Figure 11 are corresponding accident locations as well as location which exhibit a future potential for high numbers of accidents.

Table 11
1993 - 1996 High Accident Locations

Location	# of Accidents	Type of Accident
King and Main Street	9	Rear-end
Kirby and Main Street	14	Rear-end
Kirby and Main Street	10	Angled
Mountainview and King Street	10	Angled
Ingram and Main Street	16	Left Turn
Carmel and Main Street	11	Left Turn
Jefferson and Main Street	22	Left Turn
Baily Dr. and Main Street	9	Angled Turn
Marziano Dr. and Main Street	10	Left Turn
US 52 and Main Street	9	Rear-end

Chapter 6

Environmental Concerns

In the past several years, environmental considerations associated with highway construction have come to the forefront of the planning process. The legislation that dictates the necessary procedures regarding environmental impacts is the National Environmental Policy Act. Section 102 of this act requires the execution of an environmental impact statement, or EIS, for road projects that have significant impact on the environment. Included in an EIS would be the project's impact on wetlands, water quality, historic properties, wildlife, and public lands. While this report does not cover the environmental concerns in detail, preliminary research was done on several of these factors and is included below and on Figure 12.

Wetlands

In general terms, wetlands are lands where water saturation is the dominant factor in determining the nature of soil development and the types of plant and animal communities living in the soil and on its surface. The single feature most wetlands share is soil or substrata that is at least periodically saturated with or covered by water. Water creates severe physiological problems for all plants and animals except those that are adapted for life in it or in saturated soil.

Wetlands are crucial ecosystem in our environment,. They regulate and maintain the hydrology of our rivers, lakes, and streams by slowly storing and releasing flood waters. They help maintain the quality of our water by storing nutrients, reducing sediment loads, reducing habitat for about a third of the plant and animal species that are federally listed as threatened or endangered.

In this study, the impacts to wetlands area were determined using the National Wetlands Inventory produced through the NC Geographic Information System Department (see Figure 13). There were no significant wetland sites located in the King Planning Area.

Threatened and Endangered Species

A preliminary review of the federally Listed Threatened and Endangered Species within King Planning Area was done to determine the effects that new corridors could have on existing wildlife. These species were identified using information from the North Carolina Department of Environment, Health, and Natural Resources to produce Geographic Information System mapping.

The Threatened and Endangered Species Act of 1973 allows the U. S. Fish and Wildlife Service to impose measures on the Department of Transportation to mitigate the environmental impacts of a road project on endangered plants and animals and critical

wildlife habitats. By locating rare species in the planning stage, we are more likely to avoid or minimize impacts.

Historic sites

The location of historic sites in the King Planning Area was investigated to determine the possible impacts of the various projects studied. The federal government has issued guidelines requiring all State Transportation Departments to make special efforts to preserve historic sites. In addition, the state of North Carolina has issued its own guidelines for the preservation of historic sites. These two pieces of legislation are described below:

National Historic Preservation Act - Section 106 of this act requires the Department of Transportation to identify historic properties listed in the National Register of Historic Places and properties eligible to be listed. The DOT must consider the impact of its road projects on these properties or consult with the Federal Advisory Council on Historic preservation.

NC General Statute 121-12(a) - This statute requires the DOT to identify historic properties listed in the National Register, but not necessarily those eligible to be listed. DOT must consider impacts and consult with North Carolina Historical Commission, but it is bound by their recommendations.

No historical sites were found that impacted by any proposed thoroughfares or minor improvements. But King is in the process of having sites located in the downtown area and added to the National Register within the near future.

Archaeology

There were no significant archaeology sites located in the King Planning Area. However, prior to any road construction, validation that no possible archaeological sites present is strongly suggested.

CITY OF KING ENVIROMENTAL DATA

LEGEND

- Ambient Water Quality Monitoring Sites (100k)
- Citizen Water Quality Monitoring Sites (100k)
- ★ Hist. Strud.-NR (Restricted-100k)
- ▨ Hist. Dist.-NR (Restricted-100k)
- ★ Hist. Strud.-SL (Restricted-100k)
- ▨ Hist. Dist.-SL (Restricted-100k)
- Railroads (100k)
- TIP Roads (arc-24k)
- Roads (DOT 24k - no attributes)
- Railroad
- Interstate
- US
- NC
- SR
- City
- Other
- Roads (100k TIGER w/ attributes)
- Pipe, Transmission & Airports (100k)
- Trout Streams (WRC - 100k)
- Anadromous Fish Spawning Areas (100k)
- DCM Wetlands
 - High Quality Wetlands
 - Pocosin (High)
 - Medium Quality Wetlands
 - Low Quality Wetlands
- NWI (arc-24k)
- NWI (poly-24k)
- Hydro - Rivers/Streams (100k)
- Hydro - Water Bodies (100k)
- Hydro - Major Rivers/Streams (100k)
- Hydro - Major Water Bodies (100k)
- HQW Zones (100k)
- Groundwater Recharge/Discharge Areas (100k)
- Natural Areas (Restricted-24k)
- Cemeteries (100k)
- Municipal Boundaries (24k)
- State Parks (100k)
- River Basins - Major (24k)
- River Basins - Minor (24k)



FIGURE 12

1 0 1 2 3 4 Miles

Chapter 7

Traffic Model Development

In order to develop an efficient thoroughfare plan for the City of King, it was necessary to develop and calibrate a travel demand computer model for the city and surrounding area. To develop a travel demand model, the following information is necessary:

- a) Delineation of area expected to be urban during the next twenty-five years
- b) Collecting of traffic count data.
- c) Collecting of housing and employment data, determine trip generation characteristics of the study area.
- d) Developing relationships between land use and travel and projection of model data twenty-five years into the future.

All of this information was input, analyzed, and manipulated using a series of computer programs. Final results of the analysis were viewed, checked for accuracy, and furthered analyzed in a graphical computer model network format (shown in Figure 13).

The Study Area

The study area of King consists of the City and additional outlying area are shown in Figure 7. This area was determined based on what area is expected to be of urban density by the year 2025. Urban density as defined by the Bureau of Census is that area that has at least 1000 people per square mile. The study area is further divided into twenty-seven traffic analysis zones each of which have their own unique travel demand characteristics based on housing and employment in the zone. Around the periphery of the study area many roads cross the planning area boundary. Projection of travel on these roads based on historic trends and expected development adjacent to the planning area is also needed.

The Base Year Network

The purpose of the traffic model is to replicate the conditions on the major street system inside the study area. This system is represented with a series of links and nodes that represent street segments and major intersections. Nodes can also represent several small intersections that carry trips to a neighborhood or business type development. Links contain information about that section of road, such as: road width, travel speed, length, one way indicators and time penalties at traffic signals. Sometimes signal delay is represented by a slower travel speed. Road width is often represented with a number that reflects the capacity of the road. Capacity represents the ability of the road to carry traffic. Other road characteristics such as: lane width, parking, signal timing, vertical and horizontal alignment (hills and curves) and the presence of turn lanes can affect the capacity of a road.

Data Requirements

Other data requirements are primarily related to travel that is occurring on the network. Traffic counts are taken on each road that enters the study area at the point where it crosses the study area boundary. Traffic counts are also taken at many locations throughout the major street system to form a base line for travel demand model calibration. Housing is counted for each of the twenty-seven traffic analysis zones and classified as to its trip generating potential. Employment is counted by zone and categorized as to its trip attraction qualities. The result of this inventory is shown in Appendix E.

Traffic Counts and Socioeconomic Data

Traffic counts were taken by the North Carolina Department of Transportation in 1994 and adjusted for daily variations and seasonal variations to yield an average daily count. Figure 3 shows 1994 traffic counts and roadway capacities that were taken in the study area. These numbers are compared with historic counts to check for aberrations that can occur with special events such as traffic accidents or road construction.

In 1994 the North Carolina Department of Transportation counted all the dwelling units in the King study area. This included apartments, trailers and group retirement homes. This information was categorized according to its trip making characteristics and aggregated by traffic analysis zone. Employment was counted in a similar manner and classified into one of five categories: industrial, retail, highway retail, office and service. Tables 10 and 11 show the housing and employment data that was collected in 1994.

Commercial Vehicles

Commercial vehicles such as delivery trucks were inventoried as part of the employment survey for the King study area. These trip types have different characteristics than autos, with many of the trips being made during off peak hours. Large tractor-trailer vehicles can be more of an impediment to the traffic stream and can cause damage to sidewalks and shoulders if proper turn radii are not provided. Also there are impacts due to the noise they produce. More insight on these vehicles was gained through discussions with city officials.

Trip Generation

Trip generation is a process by which peripheral traffic counts, housing data and employment data are used to produce traffic volumes on the street network that closely approximate traffic counts on that same system. In the context of travel demand modeling, a trip ends every time you get out of your car. Travel from you home to work for example might actually involve several side trips to a day care facility and a fast food restaurant. Travel inside the study area has three major components: trips travelling through the study (through trips), trips coming from outside the study area (external trips), and trips staying within the study area (internal trips).

KING NETWORK MAP

LEGEND

NETWORK 

FIGURE 13



KING

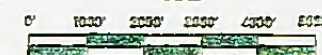
STOKES COUNTY

NORTH CAROLINA

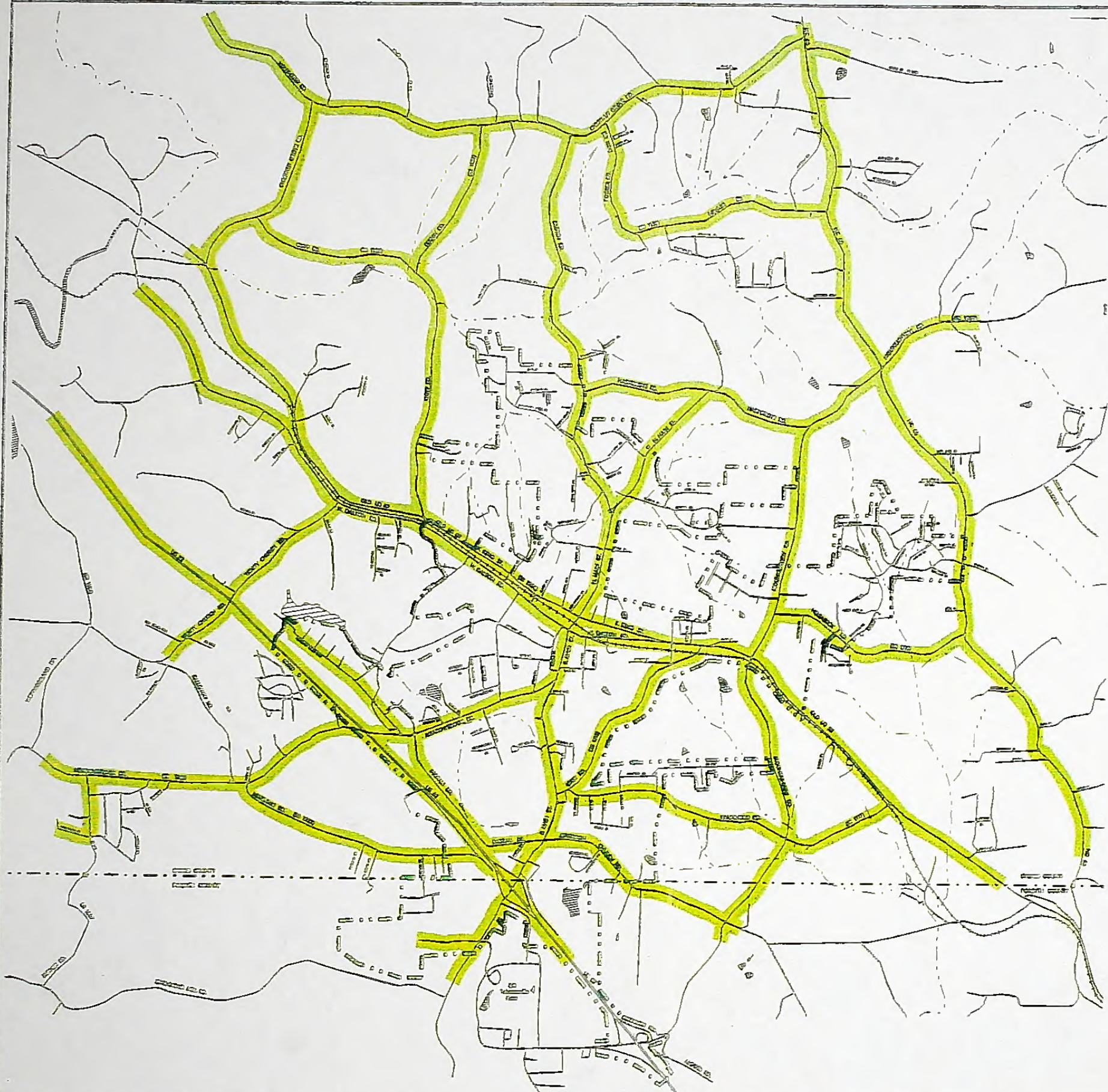
MADE BY
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION
STATEWIDE PLANNING BRANCH

IN COOPERATION WITH
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

SCALE



BASE MAP: SEPTEMBER 20, 1994



Through Trips

Most of the through travel in the King planing area occurs on US 52. An approximation of this number can be estimated by looking at interchange counts and main line volumes. An iterative approach was used based on the accuracy of previous calibration runs. Through trips on other smaller roads in the area were approximated and adjusted based on traffic counts. Table 16, Cordon Station Analysis, on page 46 shows 1994 and 2025 through travel estimates for roads coming into the study area. The analysis revealed that the 1994 through trips using Main Street, Mountainview Road, and Jefferson Church Road will more than double in the future year 2025. The proposed extending of Pilotview Road would run parallel to Main Street, will help reduce the 2025 traffic volume on Main Street. The recommended widening of Mountainview Road and Jefferson Church Road will enable both roads to carry future traffic adequately. While the 2025 through trips for US52 and NC66 north will almost triple or quadruple.

External-Internal Trips

Trips with one end outside the study area were derived by subtracting through trips from traffic counts at the study area boundary. Although trips go in both directions, they are all initially modeled as coming into the area. Later a program is run that will produce trips in both directions. Table 16 shows historical and projected traffic counts at the cordon stations. Table 16 also shows the resulting external-internal trips that result from this analysis. Comparison of the through trips to external- internal trips shows that the future 2025 traffic will predominantly be traffic traveling through the City of King. But, the analysis did show the external-internal trips having some growth in 2025. Spainhour Road, Main Street, US 52(eastern end), Jefferson Church Road, Mountainview Road, and NC 66, for example will approximately have a 30-50% growth in the future year.

Internal Data Summary (IDS)

The Internal Data Summary program was written by the North Carolina Department of Transportation to perform a series of mathematical calculations necessary to generate trip productions and attractions necessary for input into the Gravity Model. Some of the primary inputs into this program include:

1. Housing units by classification and zone
2. Employment by type and zone
3. Housing generation rates
4. Housing occupancy rates
5. Trip attraction equations
6. Percent of the trips which are internal
7. Number of secondary trips made by external trips
8. Percent of trips by trip purpose and external trip productions

Table 14 and Table 15 gives the 1994 and 2025 input housing and employment and the resulting productions and attractions. The following is a listing of other input information:

Dwelling Trip Generation Rates:

Excellent	10.5 trips per day
Above Average	8.5 trips per day
Average	6.5 trips per day
Below Average	5.0 trips per day
Poor	4.5 trips per day

Trip Attraction Equations were borrowed from the Triad Region Study:

Home based work trips attracted = $1.0 X_1 + 1.0 X_2 + 1.0 X_3 + 1.0 X_4 + 1.0 X_5 + 1.0 X_6$

Home based other trips attracted = $.04 X_1 + .77 X_2 + 7.5 X_3 + .8 X_4 + 1.9 X_5 + 1.05 X_6$

Non-home based trips attracted = $.09 X_1 + 1.53 X_2 + 2.28 X_3 + .40 X_4 + .62 X_5 + .27 X_6$

External trips attracted = $.5 X_1 + 1.0 X_2 + 1.31 X_3 + .41 X_4 + .56 X_5 + .52 X_6$

where:

- X_1 = zonal industrial employment
- X_2 = zonal retail employment
- X_3 = zonal highway retail employment
- X_4 = zonal office employment
- X_5 = zonal service employment
- X_6 = total zonal dwelling units

Percent Internal of total = 80%

Secondary External trips = 11492

Note: These are only relative trip attractions and should only be used after balancing trip productions.

Internal Trip Distribution

Once trips are generated, trip distribution must be performed. This is done using the Gravity Model. The basic premise used by the Gravity Model is that trips are attracted in direct proportion to the size of the zonal attraction and inversely proportional to spatial separation which is represented by the travel time between zones on the network. This is accomplished using the productions, attractions and friction factors listed in Table 17 on page 46. Friction factors represent the magnitude of attraction to travel due to zone and time differentials.

Model Calibration

The purpose of a traffic model is to predict the traffic on a street at some future point in time; however, if the model is not accurate, it is useless for this purpose. Therefore the model must duplicate the existing traffic pattern. The actual calibration of the model is an iterative process in which incremental changes are made either in the trip generation, trip distribution, or the street network. The purpose of each change is to allow the model to more accurately reflect the real world conditions upon which it is based. Only when the model can adequately reflect the existing traffic pattern should it be used to predict future traffic. The model was calibrated using 1994 average daily traffic counts on numerous

roads in the study area as shown on Figure 3. In areas where calibration is off, adjustments are made when using future model estimates.

Accuracy Checks

There are three checks made on the model. The first is to follow trips through all the steps involved in the model. The purpose of this check is to insure that no trips have been accidentally added to or subtracted from the model and that no trips have been counted twice.

The second check is to see if the overall number of trips generated and distributed appears to be close to the total counts. Screenlines were used in the model to determine north/south and east/west directional trip accuracy. If screen-line counts were within 10% of the load on those links, it was considered to be acceptable. Table 12 shows an overall screenline calibration of the King Planning area comparing ground counts modeled volumes. Since the modeled screenline volumes were 4.4% lower than ground counts we consider the model to be conservative in its comparison of traffic volumes to roadway capacities.

The final check for the model is to match the traffic volumes on the links with the counts on a link by link basis. This check is the most difficult to achieve and may require data entry checks, speed adjusting, trip length adjusting and special zone analysis to acquire acceptable calibration.

Table 12
Screen line Calibration for the King Planning Area

Screen-line	Ground Count	Model Volume	Percent(+/-)
A - North/South	37404	37950	1.4%
B - East/West	57359	52850	8.5%
Total Screenlines	94763	90800	4.4%

Data Projections to the Design Year

In order to make use of the model, the base year data must be projected to estimate design year travel. Most of the relationships between land use and travel for the base year are held constant for the design year, allowing travel to respond to changes in land use.

Dwelling Unit Projections

Total future dwelling units for the planning area were derived using straight line projections for the County. Using surveyed planning area housing counts as a beginning reference point, projections were made as shown in Figure 9 to estimate future housing. Using this as a control total, City officials were asked to distribute this growth to zones and

further stratify into the five housing categories used in the base year. The categories were excellent, above average, average, below average, and poor.

Employment Projections

The King Planning Board projected the employment to 2025 from zones they anticipated employment growth. Those projections were added to 1994 data. Employment projections throughout the planning area indicate tremendous localized growth with the potential for unexpected growth. Figure 9 compares the classification of employment data in 1994 to an assumed classification in 2025. Again, the travel demand model breaks down employment into five major classifications as shown in Table 10 on page 32.

External and Through Trips

For the design year, external and through trips were projected from the base year using a linear projection of the past growth rate at each external station. Cordon Station Data can be found in Table 16 on page 47.

Table 13
Travel model Input Variables

Trip Purpose	Trip Percentages	Year	Person /DU	Person /Veh
Internal of Total	80%	1994	2.6	
HBW	25%			
OHB	45%			
NHB	30%	2025	2.51	

Table 14
Travel Data Summary

Type		1994	2025
Average Daily per DU		6.07	6.11
Internal Trips		19112	42770
Home Based Work		4778	10693
Other Home Based		8600	19247
Non-Home Based, Internal		5734	12831
NHB Secondary		9162	11492
	Total Daily Trips	47386	97033

Table 15
Secondary NHB Trip Development

Secondary NHB Trips = Total EXT-INT Trips - EXT-INT Trips
Garaged Inside Planning Area X .35

1996 Secondary Trips = (36280 - 5740) X .35 = 9162
2025 Secondary Trips = (49000 - 10693) X .35 = 11492

The breakdown of internal trips by purpose and total of Non-home based trip generated externally are shown in Table 14.

Table 16
Cordon Station Analysis

Computer Station	Description	Base Year 1994			Future Year 2025		
		Total Adt	Thru Trips End	Ext-Int Prod's	Total Adt	Thru Trips End	Ext-Int Prod's
#37	Spain Hour Rd	2900	566	2330	4100	768	3330
#38	Butner Rd (Sr 1607)	550	64	490	770	64	710
#39	Main St. (Sr1112)	6700	2176	4520	10460	4008	6450
#40	US 52 East End	26800	24292	2510	65310	60964	4350
#41	Jefferson Church Rd	2300	502	1800	4170	1026	3140
#42	Mountainview Rd	5800	1876	3920	9640	4054	5590
#43	Old US 52 East End	3500	894	2610	3810	896	2910
#44	NC 66 South	5000	1668	3330	9200	4066	5130
#45	Mountainview	2800	658	2140	3060	648	2410
#46	NC 66 North	4400	1388	3010	10180	4818	5360
#47	Chestnut Grove	1100	200	900	2060	370	1690
#48	Old US 52 West End	3300	824	2480	3840	904	2940
#49	Dalton Rd (Sr1127)	1700	370	1330	1970	380	1590
#50	US 52 West End	19300	16142	3160	43280	42364	920
#51	Calloway Rd	1400	228	1170	2000	380	1620
#52	Meadowbrook Rd	700	120	580	1000	138	860
Station Totals		88250	51968	36280	174850	125848	49000

Table 17
Friction Factors

Travel Time	HBW	OHB	NHB	EXT-INT
1	8181	12000	10000	400000
2	11119	22425	15021	200000
3	13628	19971	16041	100000
4	15258	17018	15964	39459
5	14167	13999	14975	12690
6	12574	11217	13394	6117
7	10876	8832	11553	4057
8	9288	6895	9721	3399
9	7933	5385	8069	3304
10	1864	1245	1685	1419
11	500	500	500	500
12	0	0	0	0

Chapter 8

Alternative Analysis

Procedure

Before testing alternatives on the travel demand model, a loaded traffic model must be developed which shows:

1. Model response to the existing street system
2. Model response to the existing plus committed (funded projects) system
3. Model response to the existing plus committed plus TIP (identified future need projects which are not funded, but are in the Transportation Improvement from the previous thoroughfare plan).

Once these road systems have been tested and evaluated, the next logical step is to look for new corridors to improve the transportation system-wide or locally.

Suggestions for new corridors to be testing in the King area were gathered from the old thoroughfare plan, King planning staff, county staff, division office staff, and Statewide Planning staff. All recommendations were then reviewed by the above mentioned offices for further comment.

Analysis Testing

Because of the simplicity of the King network road system, listed below are 11 applicable combinations of new location corridors and structures applied to the loaded 2025 model.

1. Existing only
2. Existing + Committed
3. Existing + Committed + TIP Projects
4. E+C+T
5. Spainhour ext. only
6. Pilot View ext. only
7. Industrial Drive ext. only
8. Trinity Church Road ext. only
9. Pilot View ext. and Industrial ext.
10. E+C+T+Trinity Church Road ext. to Mountainview Road, Ingram ext. to Trinity Church Road, Fowler ext. to N. Main St., Spainhour ext., Pilot view ext., Industrial Drive ext.
11. ECT+ Trinity Church Road ext. to NC 66, Spainhour ext., Pilot view ext., Industrial Drive ext.

The Recommended Alternatives were:

- 1) Existing + Committed + TIP Project(R-2201), 2)Trinity Church Road ext. to NC 66, Spainhour ext., 4)Pilot view ext., 5)Industrial Drive ext.

The results from testing the recommended 2025 alternatives are found on page Table 8 figure. The combination(s) of road corridors yielding the best collective result in road utility (traffic volume) and road deficiency (volume/capacity ratio) was considered the most desired choice for the recommendation.

Model Validation

Each time a road corridor was tested on the computer model, checks for reasonableness of traffic volumes were made on major thoroughfares, minor thoroughfares, and then if necessary local roads (depending on the model's ability to accurately give detailed forecasting information. Also, the continued consultation with local planning staff members and division offices on these generated traffic volumes was an important part of receiving comments during the alternative analysis phase of the thoroughfare plan study.

Non-Construction Alternatives

Any recommendation to continually re-evaluate the current signal system along US501 is always a valid option to improve traffic flow. Other non-construction alternatives such special lanes to improve persons per vehicle rider-ship are not applicable at this time.

Alternatives Modes

Alternative modes of transportation were briefly discussed with city and officials following the NCDOT's general purpose and vision to pursue multi-modal possibilities. However, it is clear that in many small urban areas, such as, Roxboro, the demand for alternatives to highway travel is small.

Recommendation Determination

After each alternative was evaluated individually, and then collectively in the most applicable combinations; recommendations were made, comments were received in a public forum, and finally approved by the King City Council.

Chapter 9

Public Response

Comments

On September 23, 1998, the Statewide Planning Branch of NCDOT in support of the City of King, presented and received written and oral comments regarding the 1999 King Area Thoroughfare Plan at a public meeting. A comment form was provided during this meeting to receive all comments and suggestions on any aspect of the plan.

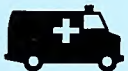
Comments by Citizens

All responses (both oral and written) have been summarized below and considered by the Statewide Planning Branch of the North Carolina Department of Transportation when determining final recommendations for the King Area Long-range Thoroughfare plan. The comment form provided at the September meeting can be found in the Appendix H (Public Involvement).

- 1. Widening of King-Tobacco Road / Main Street (SR 1611/1112)?**
 - The impact of widening TIP project R-2201 (Main Street) on local businesses.
 - Traffic congestion on Main Street due to the new five lane facility connecting to a n existing 2 lane facility.
- 2. Parallel facility to Main Street?**
 - Good road for pulling traffic off of Main Street, but citizens are concerned about the neighborhood impact of increased traffic.
- 3. Spainhour Extension (connecting from Old US 52 to NC66)?**
 - Would save time in traveling to the downtown area
 - Not sure if this should be the major priority of projects
- 4. US 52 / Trinity Road Interchange?**
 - Much needed to relieve traffic from Main Street and to promote growth in this area.
 - Need to look closer at making this interchange to main priority after Main Street widening.
- 5. Trinity Road Extension?**
 - Will definitely be of good use in the future, but we must have the Trinity Church interchange first.
 - Long-range idea for east-west travel
- 6. Industrial Drive Extension to Meadowbrook?**
 - Essential for industry expansion in the south
- 7. Newsome Road Re-alignment**
 - Good Project for facilitating traffic through industrial drive to RJR entrance.

APPENDICES

King Area Thoroughfare Plan Study



Statewide Planning Branch
NCDOT

Appendix A

Thoroughfare Planning Principles

There are many advantages to thoroughfare planning, but the primary mission is to assure that the road system will be progressively developed to serve future travel desires. Thus, the main consideration in thoroughfare planning is to make provisions for street and highway improvements so that, when the need arises, feasible opportunities to make improvements exist.

Benefits of Thoroughfare Planning

There are two major benefits derived from thoroughfare planning. First, each road or highway can be designed to perform a specific function and provide a specific level of service. This permits savings in right-of-way, construction, and maintenance costs. It also protects residential neighborhoods and encourages stability in travel and land use patterns. Second, local officials are informed of future improvements and can incorporate them into planning and policy decisions. This will permit developers to design subdivisions in a non-conflicting manner, direct school and park officials to better locate their facilities, and minimize the damage to property values and community appearance that is sometimes associated with roadway improvements.

Thoroughfare Classification Systems

Streets perform two primary functions, traffic service and land access, which when combined, are basically incompatible. The conflict is not serious if both traffic and land service demands are low. However, when traffic volumes are high, conflicts created by uncontrolled and intensely developed abutting property lead to intolerable traffic flow friction and congestion.

The underlying concept of the thoroughfare plan is that it provides a functional system of streets that permits travel from origins to destinations with directness, ease and safety. Different streets in this system are designed and called on to perform specific functions, thus minimizing the traffic and land service conflict.

Urban Classification

In the urban thoroughfare plan, elements are classified as major thoroughfares, minor thoroughfares, or local access streets.

Major Thoroughfares

These routes are the primary traffic arteries of the urban area and they accommodate traffic movements within, around, and through the area.

Minor Thoroughfares

Roadways classified under this under this type collect traffic from the local access streets and carry it to the major thoroughfare system.

Local Access Streets

This classification covers streets that have a primary purpose of providing access to the abutting property. This classification may be further classified as either residential, commercial and/or industrial depending upon the type of land use that they serve.

Idealized Major Thoroughfare System

The coordinated system of major thoroughfares that is most adaptable to the desired lines of travel within an urban area and that is reflected in most urban area thoroughfare plans is the radial-loop system. The radial-loop system includes radials, cross-towns, loops, and bypasses (Figure A-1).

Radial streets provide for traffic movement between points located on the outskirts of the city and the central area. This is a major traffic movement in most cities, and the economic strength of the central business district depends upon the adequacy of this type of thoroughfare.

If all radial streets crossed in the central area, an intolerable congestion problem would result. To avoid this problem, it is very important to have a system of cross-town streets that form a loop around the central business district. This system allows traffic moving from origins on one side of the central area to destinations on the other side to follow the area's border. It also allows central area traffic to circle and then enter the area near a given destination. The effect of a good cross-town system is to free the central area of cross-town traffic, thus permitting the central area to function more adequately in its role as a business or pedestrian shopping area.

Loop system streets move traffic between suburban areas of the city. Although a loop may completely encircle the city, a typical trip may be from an origin near a radial thoroughfare to a destination near another radial thoroughfare. Loop streets do not necessarily carry heavy volumes of traffic, but they function to help relieve central areas. There may be one or more loops, depending on the size of the urban area. They are generally spaced one-half mile to one mile apart, depending on the intensity of land use.

A bypass is designed to carry traffic through or around the urban area, thus providing relief to the city street system by removing traffic that has no desire to be in the city. Bypasses are usually designed to through-highway standards, with control of access. Occasionally, a bypass with low traffic volume can be designed to function as a portion of an urban loop. The general effect of bypasses is to expedite the movement of through traffic and to improve traffic conditions within the city. By freeing the local streets for use by shopping and home-to-work traffic, bypasses tend to increase the economic vitality of the local area.

Objectives of Thoroughfare Planning

Thoroughfare planning is the process public officials use to assure the development of the most appropriate street system that will meet existing and future travel desires within the

urban area. The primary aim of a thoroughfare plan is to guide the development of the urban street system in a manner consistent with the changing traffic patterns. A thoroughfare plan will enable street improvements to be made as traffic demands increase, and it helps eliminate unnecessary improvements, so needless expense can be averted. By developing the urban street system to keep pace with increasing traffic demands, a maximum utilization of the system can be attained, requiring a minimum amount of land for street purposes. In addition to providing for traffic needs the thoroughfare plan should embody those details of good urban planning necessary to present a pleasing and efficient urban community. The location of present and future population, commercial and industrial development affect major street and highway locations. Conversely, the location of major streets and highways within the urban area will influence the urban development pattern.

Other objectives of a thoroughfare plan include:

- * To provide for the orderly development of an adequate major street system as land development occurs;
- * To reduce travel and transportation costs;
- * To reduce the cost of major street improvements to the public through the coordination of the street system with private action;
- * To enable private interest to plan their actions, improvements, and development with full knowledge of public intent;
- * To minimize disruption and displacement of people and businesses through long range advance planning for major street improvements;
- * To reduce environmental impacts, such as air pollution, resulting from transportation, and
- * To increase travel safety.

These objectives are achieved through improving both the operational efficiency of thoroughfares, and improving the system efficiency through system coordination and layout.

Operational Efficiency

A street's operational efficiency is improved by increasing the capability of the street to carry more vehicular traffic and people. In terms of vehicular traffic, a street's capacity is defined by the maximum number of vehicles which can pass a given point on a roadway during a given time period under prevailing roadway and traffic conditions. Capacity is affected by the physical features of the roadway, nature of traffic, and weather.

Physical ways to improve vehicular capacity include:

- * **Street widening** - widening of a street from two to four lanes more than doubles the capacity of the street by providing additional maneuverability for traffic.
- * **Intersection improvements** - increasing the turning radii, adding exclusive turn lanes, and channelizing movements can improve the capacity of an existing intersection.

- * **Improving vertical and horizontal alignment** - reduces the congestion caused by slow moving vehicles.
- * **Eliminating roadside obstacles** - reduces side friction and improves a driver's field of sight.

Operational ways to improve street capacity include:

- * **Control of Access** - a roadway with complete access control can often carry three times the traffic handled by a non-controlled access street with identical lane width and number.
- * **Parking removal** - Increases capacity by providing additional street width for traffic flow and reducing friction to flow caused by parking and unparking vehicles.
- * **One-way operation** - The capacity of a street can sometimes be increased 20 -50%, depending upon turning movements and overall street width, by initiating one-way traffic operations. One-way streets can also improve traffic flow by decreasing potential traffic conflicts and simplifying traffic signal coordination.
- * **Reversible lane** - Reversible traffic lanes may be used to increase street capacity in situations where heavy directional flows occur during peak periods.
- * **Signal phasing and coordination** - Uncoordinated signals and poor signal phasing restrict traffic flow by creating excessive stop-and-go operation.

Altering travel demand is a third way to improve the efficiency of existing streets. Travel demand can be reduced or altered in the following ways:

- * **Carpools** - Encourage people to form carpools and vanpools for journeys to work and other trip purposes. This reduces the number of vehicles on the roadway and raises the people carrying capability of the street system.
- * **Alternate mode** - Encourage the use of transit and bicycle modes.
- * **Work hours** - Encourage industries, businesses, and institutions to stagger work hours or establish variable work hours for employees. This will spread peak travel over a longer time period and thus reduce peak hour demand.
- * **Land use** - Plan and encourage land use development or redevelopment in a more travel efficient manner.

System Efficiency

Another means for altering travel demand is the development of a more efficient system of streets that will better serve travel desires. A more efficient system can reduce travel distances, time, and cost to the user. Improvements in system efficiency can be achieved through the concept of functional classification of streets and development of a coordinated major street system.

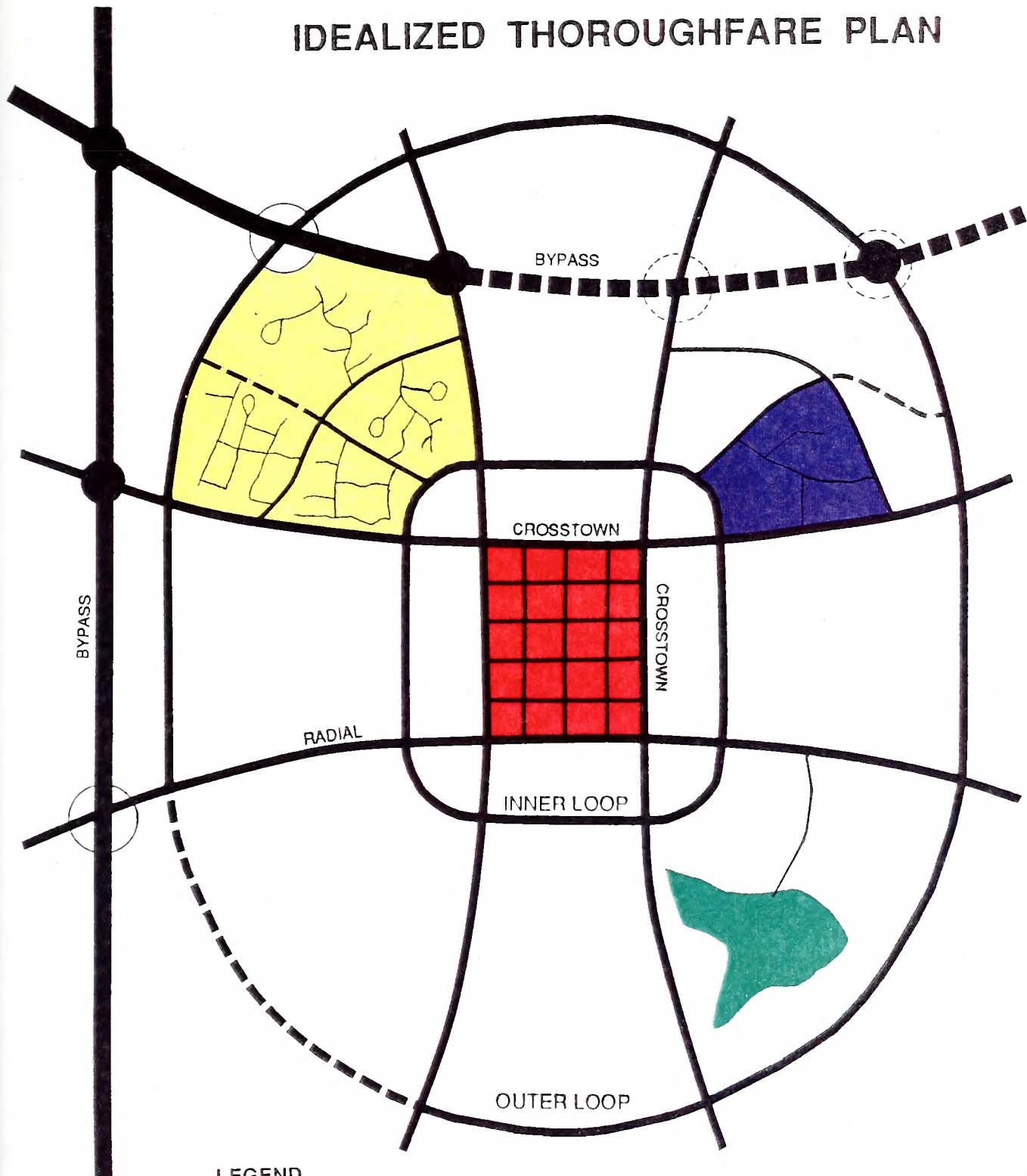
Application of Thoroughfare Planning Principles

The concepts presented in the discussion of operational efficiency, system efficiency, functional classification, and idealized major thoroughfare system are the conceptual tools available to the transportation planner in developing a thoroughfare plan. In actual practice thoroughfare planning is done for established urban area and is constrained by existing land use and street patterns, existing public attitudes and goals, and current expectations of future land use. Compromises must be made because of these and the many other factors that affect major street locations.

Through the thoroughfare planning process it is necessary from a practical viewpoint that certain basic principles be followed as closely as possible. These principles are listed below:

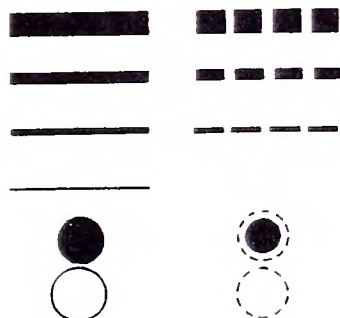
1. The plan should be derived from a thorough knowledge of today's travel - its component parts, and the factors that contribute to it, limit it, and modify it.
2. Traffic demands must be sufficient to warrant the designation and development of each major street. The thoroughfare plan should be designed to accommodate a large portion of major traffic movements on a few streets.
3. The plan should conform to and provide for the land development plan for the area.
4. Certain considerations must be given to urban development beyond the current planning period. Particularly in outlying or sparsely developed areas that have development potential, it is necessary to designate thoroughfares on a long-range planning basis to protect rights-of-way for future thoroughfare development.
5. While being consistent with the above principles and realistic in terms of travel trends, the plan must be economically feasible.

IDEALIZED THOROUGHFARE PLAN



LEGEND

EXISTING PROPOSED



LAND USES



FIGURE A-1

Appendix B

Street Tabulation and Recommendations

This appendix includes a detailed tabulation of all streets identified as elements of the City of King Thoroughfare Plan. The table includes a description of each section, as well as the length, cross section, and right-of-way for each section. Also included are existing and projected average daily traffic volumes, roadway capacity, and the recommended ultimate lane configuration. Due to space constraints, these recommended cross sections are given in the form of an alphabetic code. A detailed description of each of these codes and a illustrative figure for each can be found in Appendix C.

The following index of terms may be helpful in interpreting the table:

NPB - Northern Planning Boundary

EPB - Eastern Planning Boundary

WPB - Western Planning Boundary

SPB - Southern Planning Boundary

NCL - Northern City Limits

SCL - Southern City Limits

WCL - Western City Limits

ECL - Eastern City Limits

ADQ - Adequate

N/A - Not Available

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION						PRACTICAL			RECOMMENDED		
	S.I. UNITS		ENGLISH UNITS		NUMBER		CAPACITY		X-SECTION			
	DIST KM	RDWY M	ROW M	DIST MI	RDWY FT	ROW FT	of LANES	CURRENT (FUTURE)	1994 ADTS	2025 ADTS	RDWY (ULT)	ROW (ULT) meter
US 52												
SPB - SR 1112	1.287	14.63	60.96	0.80	48	200	4	54000	26800	65300	L	
SR 1112 - SR 1106	4.264	14.63	60.96	2.65	48	200	4	54000	19300	44500	L	
SR 1106 - KPB	2.06	14.63	60.96	1.28	48	200	4	54000	19300	44300	L	
NC 66												
SPB - SR 1117	1.255	7.3152	18.29	0.78	24	60	2	12500	5000	9200	ADQ	27
SR 1117 - SR 1119	1.126	7.3152	18.29	0.70	24	60	2	12500	5000	4000	ADQ	
SR 1119 - SR 1122	2.735	7.3152	18.29	1.70	24	60	2	12500	4500	7400	ADQ	
SR 1122 - SR1133	1.448	7.3152	18.29	0.90	24	60	2	13000	7200	12400	ADQ	
SR 1134 - SR 1136	1.448	7.3152	18.29	0.90	24	60	2	13000	3300	8400	ADQ	
SR 1136 - NBP	0.965	7.3152	18.29	0.60	24	60	2	13000	4400	10200	ADQ	
Main Street - Five Forks Road and King/Tobacco Road												
SPB - US 52	1.014	10.973	0	0.63	36		3	14000	6700	10500	ADQ	27
US 52 - SR 1108	0.467	14.63	0	0.29	48		5	26000	20000	36000	ADQ	
SR 1108 - SR 1115	0.483	14.63	0	0.30	48		5	26000	20000	27500	ADQ	
SR 1115 - SR 1105	1.126	14.63	0	0.70	48		5	(26000)	20000	8800	C	
SR 1105 - SR 1127	0.483	8.5344	0	0.30	28		2	12000	12800	10800	ADQ	
SR 1127 - SR 1236	0.161	7.3152	0	0.10	24		2	12000	7900	8400	ADQ	
SR 1236 - SR 1112	0.965	7.3152	0	0.60	24		2	12500	7400	10300	ADQ	
SR 1112 - SR 1132	1.448	7.3152	0	0.90	24		2	12500	1600	1400	ADQ	
Pilot Road Extension - Part on New Location												
SR 1112 - SR 1105	1.335	7.3152	18.29	0.83	24	60	2	(12000)	n/a	8000	I	21
SR 1105 - SR 1127	1.271	7.3152	18.29	0.79	24	60	2	(12000)	n/a	3800	I	21
SR 1127 - SR 1236	0.161	7.3152	18.29	0.10	24	60	2	(12000)	n/a	4200	I	21
SR 1236 - SR 1128	1.657	7.3152	18.29	1.03	24	60	2	(12000)	n/a	1425	I	21
				1.96								
Brown Road (SR 1128)												
SR 1112 - Pilot Rd Ext.	0.805	7.3152	0	0.50	24		2	12000	3000	3500	ADQ	
Pilot Rd Ext. - SR 1132	0.322	7.3152	0	0.20	24		2	12000	2000	4300	ADQ	
SR 1132 - KCL	0.225	7.3152	0	0.14	24		2	10000	1800	3500	ADQ	
SR 1132 - SR 1106 Ext	1.545	6.096	0	0.96	20		2	10000	1800	3500	ADQ	
SR 1106 Ext - SR 1136	1.126	6.096	0	0.70	20		2	10000	1500	3300	ADQ	
Chestnut Grove Road (SR 1136)												
NC66 - SR 1134	2.092	6.096	18.29	1.30	20	60	2	11500	2300	4900	ADQ	
SR 1134 - SR1128	0.322	6.096	18.29	0.20	20	60	2	11500	2700	4700	ADQ	
SR 1128 - SR 1137	0.644	6.096	18.29	0.40	20	60	2	11500	1600	3500	ADQ	
SR 1137 - Volunteer Rd	1.448	6.096	18.29	0.90	20	60	2	11500	1100	1000	ADQ	

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION						PRACTICAL		RECOMMENDED			
	I. UNITS			ENGLISH UNITS			NUMBER	CAPACITY	X-SECTION			
	DIST KM	RDWY M	ROW M	DIST MI	RDWY FT	ROW FT	of LANES	CURRENT (FUTURE)	1994 ADTS	2025 ADTS	RDWY (ULT)	ROW (ULT) meter
Chestnut Grove Road (SR 1139)												
Volunteer Rd - SR 1138	1.126	6.7056	18.29	0.70	22	60	2	11500	1000	1700	ADQ	
SR 1138 - SR 1236	0.644	6.7056	18.29	0.40	22	60	2	11500	1400	2000	ADQ	
SR 1236 (King Street - Old US 52)												
Forsyth CL - SR 1117	1.931	6.096	0	1.20	20		2	11000	3500	3800	ADQ	
SR 1117 - ECL	0.756	6.096	0	0.47	20		2	11000	3200	5400	ADQ	
ECL - SR 1122	1.014	6.7056	0	0.63	22		2	11000	3200	5400	ADQ	
SR 1122 - SR 1115	0.483	6.7056	0	0.30	22		(4)	(20000)	11400	17500	G	21.
SR 1115 - SR 1127	0.322	6.7056	0	0.20	22		2	11000	5600	10100	ADQ	
SR 1127 - SR 1112	0.805	6.7056	0	0.50	22		2	11000	3400	5900	ADQ	
SR 1112 - Pilot Ext.	0.805	6.7056	0	0.50	22		2	11000	2600	4500	ADQ	
Pilot Ext. - WCL	0.805	6.7056	0	0.50	22		2	11000	2800	5300	ADQ	
WCL - SR 1138	0.161	6.096	0	0.10	20		2	11000	2800	5300	ADQ	
SR 1138 - SR 1106	0.644	6.096	0	0.40	20		2	11000	3200	5300	ADQ	
SR 1106 - SR 1139	2.253	6.096	0	1.40	20		2	10500	3000	4000	ADQ	
SR 1139 - WPB	0.805	32.18	0	0.50	20		2	10500	3300	3900	ADQ	
SR 1127 (Dalton Road)												
SR 1236 - SR 1112	0.805	6.096	0	0.5	20		2	11000	2200	4200	ADQ	
SR 1112 - Pilot Ext.	0.644	5.4864	0	0.4	18		2	8000	4200	4400	ADQ	
Pilot Ext. - WCL	0.805	6.096	0	0.5	20		2	8000	4200	4600	ADQ	
WCL - SR 1138	0.805	6.096	0	0.5	20		2	10500	4200	4600	ADQ	
SR 1138 - SR 1106	0.805	6.096	0	0.5	20		2	10500	1900	2900	ADQ	
SR 1106 - WPB	3.218	6.096	0	2.0	20		2	10500	1700	2000	ADQ	
SR 1105 (Meadowbrook Drive)												
WPB - SR 1222	1.287	7.3152	0	0.80	24		2	12500	1300	6500	ADQ	
SR 1222 - WCL	0.917	7.3152	0	0.57	24		2	12500	2900	4500	ADQ	
WCL - Industrial Dr Ext.	0.08	7.3152	0	0.05	24		2	12500	1700	4500	ADQ	
Industrial Dr Ext. - US 52	0.08	7.3152	0	0.05	24		2	12500	1700	2800	ADQ	
US 52 - Ingram	0.644	7.3152	0	0.40	24		2	12500	1700	2800	ADQ	
Ingram - Pilot Ext.	0.885	7.3152	0	0.55	24		2	12500	1700	2500	ADQ	
Pilot Ext. - SR 1112	0.563	7.3152	0	0.35	24		2	12500	4000	4100	ADQ	
SR 1122 (Mountain View Road)												
SR 1236 - SR 1119	0.483	7.3152	0	0.30	24		2	13000	9120	11000	ADQ	
SR 1119 - SR 1132	1.77	7.3152	0	1.10	24		2	13000	6300	10200	ADQ	
SR 1132 - NC 66	0.805	7.3152	0	0.50	24		2	13000	7900	12800	ADQ	

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION						PRACTICAL		RECOMMENDED			
	I. UNITS			ENGLISH UNITS			NUMBER	CAPACITY	X-SECTION			
	DIST KM	RDWY M	ROW M	DIST MI	RDWY FT	ROW FT	of LANES	CURRENT (FUTURE)	1994 ADTS	2025 ADTS	RDWY (ULT)	ROW (ULT) meter
SR1222 (Newsome Road) and Newsome Road Re-alignment												
SR 1105 - SR 1112	2.977	7.3152	18.29	1.85	24	60	2	10500	2600	4100	ADQ	
Industrial Drive Extension												
SR 1112 - SR 1105	0.57	7.3152	18.29	0.71	24	60						
SR 1222 - SR 1105	0.57	7.3152	18.29	0.71	24	60	2	(12000)		3000	I	21
SR 1119 (Helsabeck Road)												
NC 66 - SR 1122	1.77	6.096	18.29	1.10	20	60	2	10000	3800	2600	ADQ	
SR 1115 (Kirby Road)												
SR 1112 - SR 1117	0.161	7.3152	18.29	0.10	24	60	3	11500	6100	13400	H	18
SR 1117 - SR 1236	1.77	7.3152	18.29	1.10	24	60	2	(14000)	4000	6600	ADQ	
SR1333, SR1134 (Fowler Road)												
SR 1136 - Tnnity Church Ext*	0.965	6.096	18.29	0.60	20	60	2	11500	900	700	ADQ	
Tnnity Church Ext* - NC 66	1.77	6.096	18.29	1.10	20	60	2	11500	1000	4100	ADQ	
SR 1132 (Hartgrove Road)												
SR 1122 - SR 1112	0.965	6.096	0	0.60	20		2	10000	1900	2400	ADQ	
SR 1112 - SR 1128	1.126	6.096	0	0.70	20		2	10000	300	1000	ADQ	
SR 1108 (Jefferson Church Road)												
SR 1112 - Forsyth CL	0.483	6.7056	0	0.30	22		2	11000	3100	8800	ADQ	
Forsyth CL - SR 1634	1.4	6.7056	0	0.87	22		2	11000	3100	8800	ADQ	
SR 1634 - SPB	0.402	6.7056	0	0.25	22		2	11000	2300	4200	ADQ	
SR 1106 (Trinity Church Road)												
Calloway Rd - US 52	0.772	7.3152	0	0.48	24		2	12500	1300	6200	ADQ	
US 52 - SR 1127	1.303	7.3152	0	0.81	24		2	12500	1300	10400	ADQ	
SR 1106 (Trinity Church Road Extension) - New Location												
SR 1127 - SR 1236	0.161	7.315	30.48	0.10	24	100	2	(13000)	n/a	3000	O	30
SR 1236 - SR 1138	2.317	7.315	30.48	1.44	24	100	2	(13000)	n/a	3000	O	30
SR 1138 - SR 1128	1.4	7.315	30.48	0.87	24	100	2	(13000)	n/a	3000	O	30
SR 1128 - SR 1134	0.889	7.315	30.48	0.54	24	100	2	(13000)	n/a	3000	O	30
SR 1116, SR 1117 (Spainhour Road)												
SR 1115 - SR 1634	0.805	7.3152	0	0.50	24		2	11000	2200	6800	ADQ	
SR 1634 - SR 1236	1.191	7.3152	0	0.74	24		2	11000	1000	7000	ADQ	
SR 1117 (Spainhour Extension) - New Location												
SR 1236 - NC 66	1.883	7.315	0	1.17	24		2	(12500)	n/a	6500	ADQ	30

Appendix B

Thoroughfare Plan Street Tabulation and Recommendations

FACILITY & SECTION	EXISTING CROSS-SECTION						PRACTICAL CAPACITY	RECOMMENDED				
	I. UNITS		ENGLISH UNITS			NUMBER		X-SECTION				
	DIST KM	RDWY M	ROW M	DIST MI	RDWY FT	ROW FT	of LANES	CURRENT (FUTURE)	1994 ADTS	2025 ADTS	RDWY (ULT)	ROW (ULT) meter
SR 1138 (Goff Road)												
SR 1139 - SR 1137	0.145	6.096	0	0.09	20		2	10500	1000	3300	ADO	
SR 1137 - SR 1106 Ext*	0.322	6.096	0	0.20	20		2	10500	1000	4700	ADQ	
SR 1106 Ext* - SR 1236	1.931	6.096	0	1.20	20		2	10500	1000	2400	ADO	
SR 1127 - SR 1236	0.161		0	0.10	20		2	10500	2200	2800	ADQ	
SR 1137 (Priddy Road)												
SR 1136 - SR 1138	1.448	6.096	0	0.90	20		2	11000	1000	2400	ADO	
SR 1223 (Butler Road)												
SR 1105 - SR 1116	0.965	6.096	0	0.60	20		2	7000	560	780	ADQ	
SR 1634 (Moore Road)												
SPB - SR 1108	0.547	6.7056	0	0.34	22		2	12500	5800	9700	ADO	
SR 1108 - SR 1117	1.271	7.3152	0	0.79	24		2	12500	3900	5100	ADQ	
SR 1117 - SR 1249	0.965	7.3152	0	0.60	24		2	13000	5200	6000	ADQ	
SR 1249 - SR 1236	0.644	7.3152	0	0.40	24		2	13000	5300	6200	ADO	

Appendix C

Typical Cross Sections

Cross section requirements for thoroughfares vary according to the desired capacity and level of service to be provided. Universal standards in the design of thoroughfares are not practical. Each street section must be individually analyzed and its cross section requirements determined on the basis of amount and type of projected traffic, existing capacity, desired level of service, and available right-of-way. Typical cross section recommendations are shown in Figure C-1. These cross sections are typical for facilities on new location and where right-of-way constraints are not critical. For widening projects and urban projects with limited right-of-way, special cross sections should be developed that meet the needs of the project.

The recommended typical cross sections shown in Appendix B, Table B-1 were derived on the basis of projected traffic, existing capacities, desirable levels of service, and available right-of-way.

On all existing and proposed major thoroughfares delineated on the thoroughfare plan, adequate right-of-way should be protected or acquired for the ultimate cross sections. Ultimate desirable cross sections for each of the thoroughfares are listed in Appendix B. Recommendations for "ultimate" cross sections are provided for the following:

1. thoroughfares which may require widening after the current planning period
2. thoroughfares which are borderline adequate and accelerated traffic growth could render them deficient
3. thoroughfares where an urban curb and gutter cross section may be locally desirable because of urban development or redevelopment.

Recommended design standards relating to grades, sight distances, degree of curve, super elevation, and other considerations for thoroughfares are given in Appendix D.

A - Four Lanes Divided with Median - Freeway

Typical for four lane divided highways in rural areas which may have only partial or no control of access. The minimum median width for this cross section is 14 m (46 feet), but a wider median is desirable.

B - Seven Lanes - Curb & Gutter

This cross section is not recommended for new projects. When the conditions warrant six lanes, cross section "D" should be recommended. Cross section "B" should be used only in special situations such as when widening from a five lane section and right-of-way is limited. Even in these situations, consideration should be given to converting the center turn lane to a median so that cross section "D" is the final cross section.

C - Five Lanes - Curb & Gutter

Typical for major thoroughfares, this cross section is desirable where frequent left turns are anticipated as a result of abutting development or frequent street intersections.

D - Six Lanes Divided with Raised Median - Curb & Gutter/ E - Four Lanes Divided with Raised Median - Curb and Gutter

These cross sections are typically used on major thoroughfares where left turns and intersection streets are not as frequent. Left turns would be restricted to a few selected intersections. The

4.8 m (16 ft) median is the minimum recommended for an urban boulevard type cross section. most instances, monolithic construction should be utilized due to greater cost effectiveness, ease and speed of placement, and reduced future maintenance requirements. In special cases, grassed or landscaped medians result in greatly increased maintenance costs and an increase danger to maintenance personnel. Non-monolithic medians should only be recommended when the above concerns are addressed.

F - Four Lanes Divided - Boulevard, Grass Median

Recommended for urban boulevards or parkways to enhance the urban environment and to improve the compatibility of major thoroughfares with residential areas. A minimum median width of 7.3 m (24 ft) is recommended with 9.1 m (30 ft) being desirable.

G - Four Lanes - Curb & Gutter

This cross section is recommended for major thoroughfares where projected travel indicates a need for four travel lanes but traffic is not excessively high, left turning movements are light, and right-of-way is restricted. An additional left turn lane would probably be required at major intersections. This cross section should be used only if the above criteria is met. If right-of-way is not restricted, future strip development could take place and the inner lanes could become de facto left turn lanes.

H - Three Lanes - Curb & Gutter

In urban environments, thoroughfares which are proposed to function as one-way traffic carriers would typically require cross section "H".

I - Two Lanes - C&G, Parking both sides: J - Two Lanes - C&G, Parking one side

Cross section "I" and "J" are usually recommended for urban minor thoroughfares since these facilities usually serve both land service and traffic service functions. Cross section "I" would be used on those minor thoroughfares where parking on both sides is needed as a result of more intense development.

K - Two Lanes - Paved Shoulder

This cross section is used in rural areas or for staged construction of a wider multi-lane cross section. On some thoroughfares, projected traffic volumes may indicate that two travel lanes will adequately serve travel for a considerable period of time. For areas that are growing and future widening will be necessary, the full right-of-way of 30 m (100 ft) should be required. In some instances, local ordinances may not allow the full 30 m. In those cases, 21 m (70 ft) should be preserved with the understanding that the full 30 m will be preserved by use of building setbacks and future street line ordinances.

L - Six Lanes Divided with Grass Median - Freeway

Cross section "L" is typical for controlled access freeways. The 14 m (46 ft) grassed median is the minimum desirable median width, but there could be some variation from this depending upon design considerations. Right-of-way requirements would typically vary upward from 70 m (228 ft) depending upon cut and fill requirements.

M - Eight Lanes Divided with Raised Median - Curb & Gutter

Also used for controlled access freeways, this cross section may be recommended for freeways going through major urban areas or for routes projected to carry very high volumes of traffic.

N - Five Lanes/C&G, Widened Curb Lanes; O - Two Lane/Shoulder Section; P - Four Lanes Divided/Raised Median, C&G, Widened Curb Lanes

If there is sufficient bicycle travel along the thoroughfare to justify a bicycle lane or bikeway, additional right-of-way may be required to contain the bicycle facilities. The North Carolina Bicycle Facilities Planning and Design Guidelines should be consulted for design standards for bicycle facilities. Cross sections "N", "O", and "P" are typically used to accommodate bicycle travel.

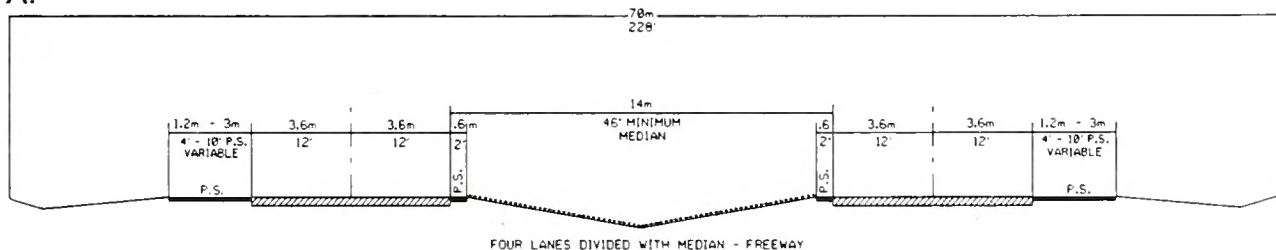
General

The urban curb and gutter cross sections all illustrate the sidewalk adjacent to the curb with a buffer or utility strip between the sidewalk and the minimum right-of-way line. This permits adequate setback for utility poles. If it is desired to move the sidewalk farther away from the street to provide additional separation for pedestrians or for aesthetic reasons, additional right-of-way must be provided to insure adequate setback for utility poles.

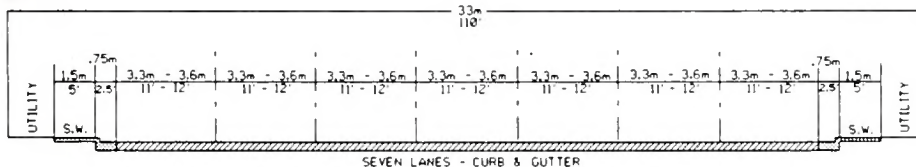
The right-of-ways shown for the typical cross sections are the minimum right-of-way required to contain the street, sidewalks, utilities, and drainage facilities. Cut and fill requirements may require either additional right-of-way or construction easements. Obtaining construction easements is becoming the more common practice for urban thoroughfare construction.

TYPICAL THOROUGHFARE CROSS SECTIONS

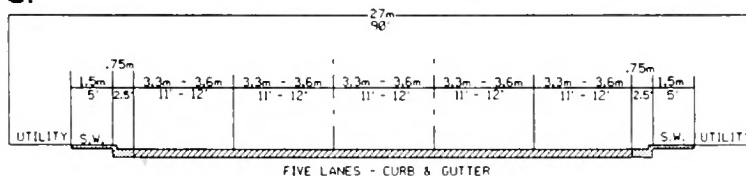
A.



B.



C.



D.

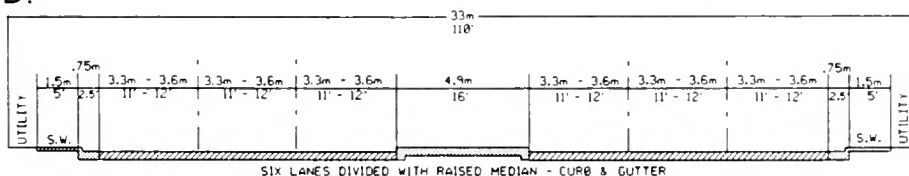
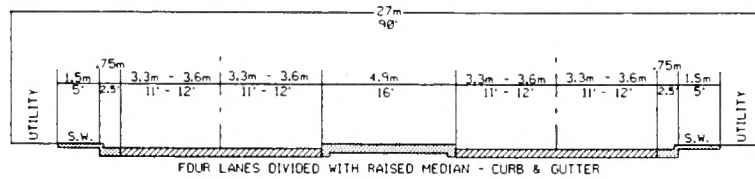


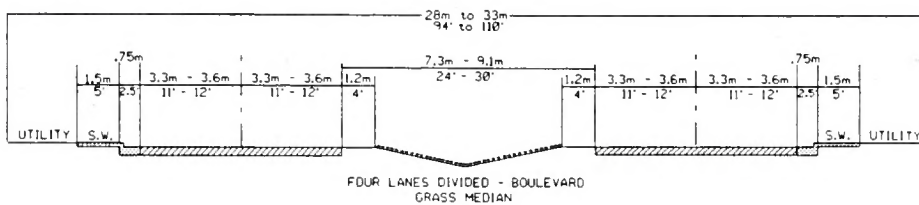
FIGURE B-1

TYPICAL THOROUGHFARE CROSS SECTIONS

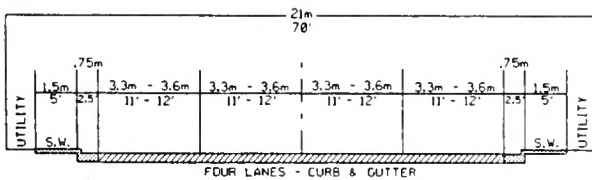
E.



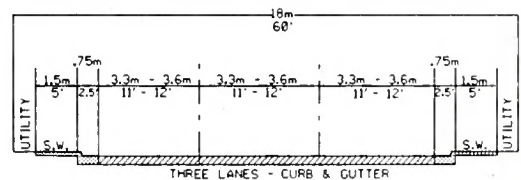
F.



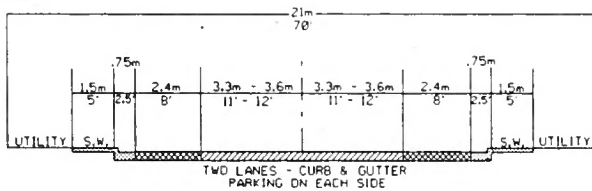
G.



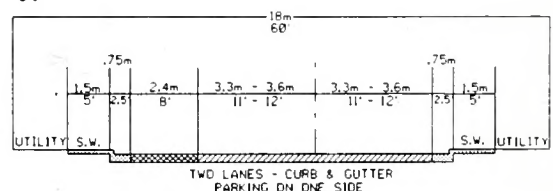
H.



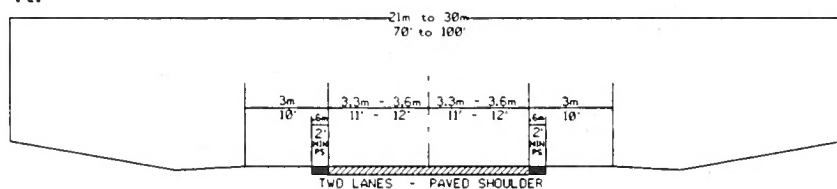
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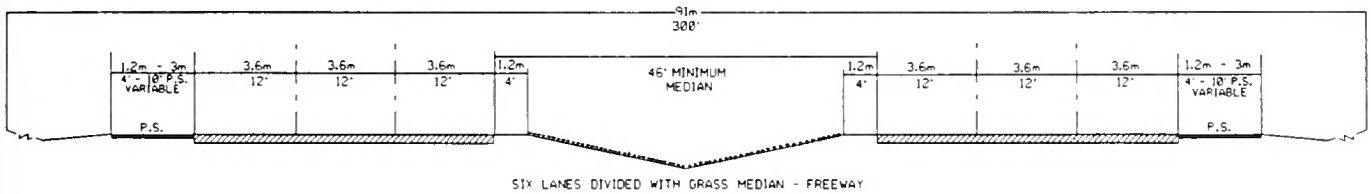


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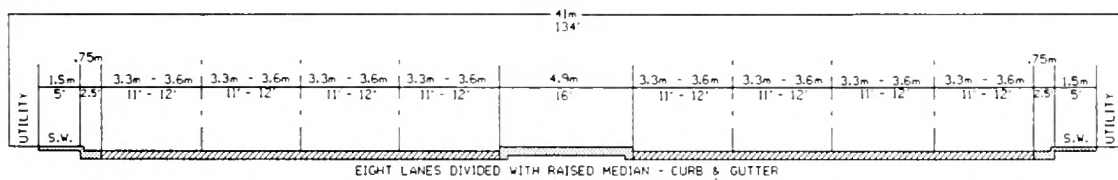


TYPICAL THOROUGHFARE CROSS SECTIONS

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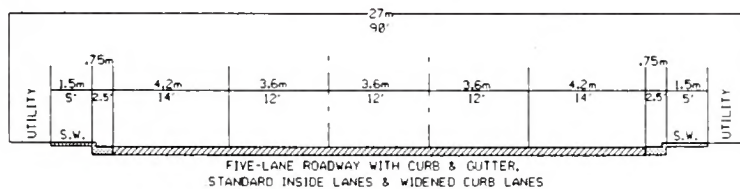


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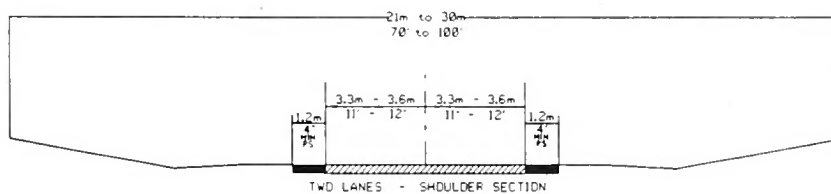


TYPICAL THOROUGHFARE CROSS SECTIONS FOR ACCOMMODATING BICYCLES

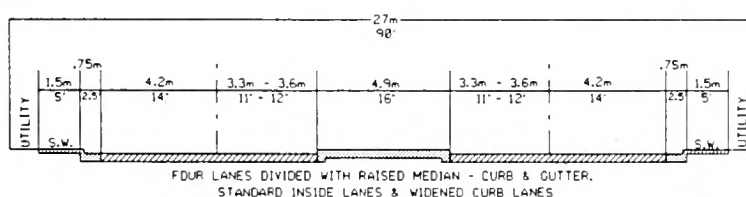
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P.



Appendix D

Recommended Subdivision Ordinances

Streets and Roads

Rural Roads

1. *Principal Arterial* - A rural link in a highway system serving travel, and having characteristics indicative of substantial statewide or interstate travel and existing solely to serve traffic. This network would consist of Interstate routes and other routes designated as principal arterials.
2. *Minor Arterial* - A rural roadway joining cities and larger towns and providing intra-state and inter-county service at relatively high overall travel speeds with minimum interference to through movement.
3. *Major Collector* - A road that serve major intra-county travel corridors and traffic generators and provides access to the Arterial system.
4. *Minor Collector* - A road that provides service to small local communities and traffic generators and provides access to the Major Collector system.
5. *Local Road* - A road that serves primarily to provide access to adjacent land, over relatively short distances.

Urban Streets

1. *Major Thoroughfares* - Major thoroughfares consist of Inter-state, other freeway, expressway, or parkway roads, and major streets that provide for the expeditious movement of high volumes of traffic within and through urban areas.
2. *Minor Thoroughfares* - Minor thoroughfares perform the function of collecting traffic from local access streets and carrying it to the major thoroughfare system. Minor thoroughfares may be used to supplement the major thoroughfare system by facilitating minor through traffic movements and may also serve abutting property.
3. *Local Street* - A local street is any street not on a higher order urban system and serves primarily to provide direct access to abutting land.

Specific Type Rural or Urban Streets

1. *Freeway, expressway, or parkway* - Divided multilane roadways designed to carry large volumes of traffic at high speeds. A *freeway* provides for continuous flow of vehicles with no direct access to abutting property and with access to selected crossroads only by way of interchanges. An *expressway* is a facility with full or partial control of access and generally with grade separations at major intersections. A *parkway* is for non-commercial traffic, with full or partial control of access.

2. *Residential Collector Street* - A local street which serves as a connector street between local residential streets and the thoroughfare system. Residential collector streets typically collect traffic from 100 to 400 dwelling units.
3. *Local Residential Street* - Cul-de-sacs, loop streets less than 760 meters (2500 ft) in length, or streets less than 1.6 kilometers (1.0 miles) in length that do not connect thoroughfares, or serve major traffic generators, and do not collect traffic from more than 100 dwelling units.
4. *Cul-de-sac* - A short street having only one end open to traffic and the other end being permanently terminated and a vehicular turn-around provided.
5. *Frontage Road* - A road that is parallel to a partial or full access controlled facility and provides access to adjacent land.
6. *Alley* - A strip of land, owned publicly or privately, set aside primarily for vehicular service access to the back side of properties otherwise abutting on a street.

Property

Building Setback Line

A line parallel to the street in front of which no structure shall be erected.

Easement

A grant by the property owner for use by the public, a corporation, or person(s), of a strip of land for a specific purpose.

Lot

A portion of a subdivision, or any other parcel of land, which is intended as a unit for transfer of ownership or for development or both. The word "lot" includes the words "plat" and "parcel".

Subdivision

Subdivider

Any person, firm, corporation or official agent thereof, who subdivides or develops any land deemed to be a subdivision.

Subdivision

All divisions of a tract or parcel of land into two or more lots, building sites, or other divisions for the purpose, immediate or future, of sale or building development and all divisions of land involving the dedication of a new street or change in existing streets.

The following shall not be included within this definition nor subject to these regulations.

The combination or re-combination of portions of previously platted lots where the total number of lots is not increased and the resultant lots are equal to or exceed the standards contained herein the division of land into parcels greater than 4 hectares (10 acres) where no street right-of-way dedication is involved the public acquisition, by purchase, of strips of land for the widening or the opening of streets the division of a tract in single ownership whose entire area is no greater than 0.8 hectares (2 acres) into not more than three lots, where no street right-of-way dedication is involved and where the resultant lots are equal to or exceed the standards contained herein.

Dedication

A gift, by the owner, of his property to another party without any consideration being given for the transfer. The dedication is made by written instrument and is completed with an acceptance.

Reservation

Reservation of land does not involve any transfer of property rights. It constitutes an obligation to keep property free from development for a stated period of time.

Design Standards

Streets and Roads

The design of all roads within the Planning Area shall be in accordance with the accepted policies of the North Carolina Department of Transportation, Division of Highways, as taken or modified from the American Association of State Highway Officials' (AASHTO) manuals.

The provision of street rights-of-way shall conform and meet the recommendations of the Thoroughfare Plan, as adopted by the municipality. The proposed street layout shall be coordinated with the existing street system of the surrounding area. Normally the proposed streets should be the extension of existing streets if possible.

Right-of-way Widths

Right-of-way (ROW) widths shall not be less than the following and shall apply except in those cases where (ROW) requirements have been specifically set out in the Thoroughfare Plan.

The subdivider will only be required to dedicate a maximum of 30 meters (100 ft) of right-of-way. In cases where over 30 meters (100 ft) of right-of-way is desired, the subdivider will be required only to reserve the amount in excess of 30 meters (100 ft). On all cases in which right-of-way is sought for a fully controlled access facility, the subdivider will only be required to make a reservation. It is strongly recommended that subdivisions provide access to properties from internal streets, and that direct property access to major thoroughfares, principle and minor arterials, and major collectors be avoided. Direct property access to minor thoroughfares is also undesirable.

A partial width right-of-way, not less than 18 meters (60 ft) in width, may be dedicated when adjoining undeveloped property that is owned or controlled by the subdivider; provided that the width of a partial dedication be such as to permit the installation of such facilities as may be necessary to serve abutting lots. When the said adjoining property is sub-divided, the remainder of the full required right-of-way shall be dedicated.

Table D-1
Minimum Right-of-way Requirements

Area Classification	Functional Classification	Minimum ROW
RURAL	Principle Arterial	Freeways- 105 m (350 ft)
		Other- 60 m (200 ft)
	Minor Arterial	30 m (100 ft)
	Major Collector	30 m (100 ft)
	Minor Collector	24 m (80 ft)
	Local Road	18 m ¹ (60 ft)
URBAN	Major Thoroughfare	27 m (90 ft)
	Minor Thoroughfare	21 m (70 ft)
	Local Street	18 m ¹ (60 ft)
	Cul-de-sac	variable ²

The desirable minimum right-of-way (ROW) is 18 meters (60 ft). If curb and gutter is provided, 15 meters (50 ft) of ROW is adequate on local residential streets.

The ROW dimension will depend on radius used for vehicular turn around. Distance from edge of pavement of turn around to ROW should not be less than distance from edge of pavement to ROW on street approaching turn around.

Street Widths

Widths for street and road classifications other than local shall be as recommended by the Thoroughfare Plan. Width of local roads and streets shall be as follows:

1. Local Residential

- * Curb and Gutter section - 7.8 meters (26 ft), face to face curb
- * Shoulder section - 6.0 meters (20 ft) to edge of pavement, 1.2 meters (4 ft) for shoulders

2. Residential Collector

- * Curb and Gutter section - 10.2 meters (34 ft), face to face of curb
- * Shoulder section - 6.0 meters (20 ft) to edge of pavement, 1.8 meters (6 ft) for shoulders

Geometric Characteristics

The standards outlined below shall apply to all subdivision streets proposed for addition to the State Highway System or Municipal Street System. In cases where a subdivision is sought adjacent to a proposed thoroughfare corridor, the requirements of dedication and reservation discussed under Right-of-way shall apply.

1. *Design Speed* - The design speed for a roadway should be a minimum of 10 km/h (5 mph) greater than the posted speed limit. The design speeds for subdivision type streets are shown in Tables D-2 (metric) and D-3 (english).
2. *Minimum Sight Distance* - In the interest of public safety, no less than the minimum sight distance applicable shall be provided. Vertical curves that connect each change in grade shall be provide and calculated using the parameters set forth in Tables D-4 (metric) and D-5 (english).
3. *Superelevation* - Tables D-6 (metric) and D-7 (english) show the minimum radius and the related maximum superelevation for design speeds. The maximum rate of roadway superelevation (e) for rural roads with no curb and gutter is 0.08. The maximum rate of superelevation for urban streets with curb and gutter is 0.06, with 0.04 being desirable.
4. *Maximum and Minimum Grades*
 - * the maximum grades in percent are shown in Table D-8 (metric) and D-9 (english)
 - * minimum grade should not be less then 0.5%
 - * grades for 30 meters (100 ft) each way from intersections (measured from edge of pavement) should not exceed 5%.

Table D-2
Design Speeds (Metric)

Facility Type	Design Speed (km/h)			
	Desirable	Minimum		
		Level	Rolling	
RURAL				
Minor Collector Roads(ADT Over 2000)	100	80	60	
Local Roads ¹ (ADT Over 400)	80	80	60	
URBAN				
Major Thoroughfares ²	100	60	60	
Minor Thoroughfares	100	50	50	
Local Streets	50	50	30	

¹Local Roads including Residential Collectors and Local Residential.

²Major Thoroughfares other than Freeways or Expressways.

Table D-3
Design Speeds (English)

Facility Type	Design Speed (km/h)			
	Desirable	Minimum		
		Level	Rolling	
RURAL				
Minor Collector Roads(ADT Over 2000)	60	50	40	
Local Roads ¹ (ADT Over 400)	50	*50	*40	
URBAN				
Major Thoroughfares ²	60	50	40	
Minor Thoroughfares	40	30	30	
Local Streets	30	**30	**20	

Note: *Based on ADT of 400-750. Where roads serve a limited area and small number of units, can reduce minimum design speed. **Based on projected ADT of 50-250. (Reference NCDOT Roadway Design Manual page 1-1B)

¹Local Roads including Residential Collectors and Local Residential.

²Major Thoroughfares other than Freeways or Expressways.

Table D-4
Sight Distance (Metric)

Design Speed (km/h)	Stopping Distance (meters)	Sight Minimum	K ¹ Values (meters)		Passing Distance (meters)	Sight
			Crest Curve	Sag Curve		
	Desirable	Minimum			For 2-lanes	
30	30	29.6	3	4	*	
50	70	57.4	9	11	*	
60	90	74.3	14	15	*	
90	170	131.2	43	30	*	
100	210	157.0	62	37	*	

Note: General practice calls for vertical curves to be multiples of 10 meters. Calculated lengths shall be rounded up in each case. *Minimum passing distance for 2-lanes is currently under revision. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-1)

¹K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table D-5

Sight Distance (English)

Design Speed (mph)	Stopping Distance (feet)	Sight Minimum	Minimum K ¹ Values (feet)		Passing Distance (feet) For 2-lanes	Sight
			Crest Curve	Sag Curve		
	Desirable	Minimum				
30	200	200	30	40	1100	
40	325	275	60	60	1500	
50	475	400	110	90	1800	
60	650	525	190	120	2100	

Note: General practice calls for vertical curves to be multiples of 50 feet. Calculated lengths shall be rounded up in each case.

(Reference NCDOT Roadway Design Manual page 1-12 T-1)

¹K is a coefficient by which the algebraic difference in grade may be multiplied to determine the length of the vertical curve which will provide the desired sight distance. Sight distance provided for stopped vehicles at intersections should be in accordance with "A Policy on Geometric Design of Highways and Streets, 1990".

Table D-6

Superelevation Table (Metric)

Design Speed (km/hr)	Minimum Radius of Maximum e ¹		Maximum Degree of Curve	
	e=0.04	e=0.06	e=0.08	
50	100	90	80	
65	175	160	145	
80	280	250	230	
100	490	435	395	

¹e = rate of roadway superelevation, meter per meter.

Table D-7

Superelevation Table (English)

Design Speed (mph)	Minimum Radius of Maximum e ¹			Maximum Degree of Curve		
	e=0.04	e=0.06	e=0.08	e=0.04	e=0.06	e=0.08
30	302	273	260	19 00'	21 00'	22 45'
60	573	521	477	10 00'	11 15'	12 15'
80	955	955	819	6 00'	6 45'	7 30'
100	1,637	1,432	1,146	3 45'	4 15'	4 45'

¹e = rate of roadway superelevation, foot per foot

Note: (Reference NCDOT Roadway Design Manual page 1-12 T-6 thru T-8)

Table D-8
Maximum Vertical Grade (Metric)

RURAL Facility Type	Minimum Grade in Percent Design Speed (km/h)	Flat	e=0.06 Rolling	e= Mountainous
Minor Collector Roads	30	7	10	12
*	50	7	9	10
	65	7	8	10
	80	6	7	9
	100	5	6	8
	110	4	5	6
Local Roads* ¹	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

URBAN Facility Type	Minimum Grade in Percent Design Speed (km/h)	Flat	e=0.06 Rolling	e= Mountainous
Major Thoroughfares ²	50	8	9	11
	65	7	8	10
	80	6	7	9
	100	5	6	8
Minor Thoroughfares*	30	9	12	14
	50	9	11	12
	65	9	10	12
	80	7	8	10
	100	6	7	9
	110	5	6	7
Local Streets*	30	-	11	16
	50	7	10	14
	65	7	9	12
	80	6	8	10
	100	5	6	-

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

¹Local Roads including Residential Collectors and Local Residential.

²Major Thoroughfares other than Freeways or Expressways.

Table D-9

Maximum Vertical Grade (English)

RURAL Facility Type	Design Speed (km/h)	Minimum Grade in Percent			e=
		Flat	Rolling	Mountainous e=0.06	
Minor Collector Roads*	20	7	10	12	
	30	7	9	10	
	40	7	8	10	
	50	6	7	9	
	60	5	6	8	
	70	4	5	6	
Local Roads* ¹	20	-	11	16	
	30	7	10	14	
	40	7	9	12	
	50	6	8	10	
	60	5	6	-	
URBAN Facility Type	Design Speed (km/h)	Minimum Grade in Percent			e=
		Flat	Rolling	Mountainous e=0.06	
Major Thoroughfares ²	30	8	9	11	
	40	7	8	10	
	50	6	7	9	
	60	5	6	8	
Minor Thoroughfares*	20	9	12	14	
	30	9	11	12	
	40	9	10	12	
	50	7	8	10	
	60	6	7	9	
	70	5	6	7	
Local Streets*	20	-	11	16	
	30	7	10	14	
	40	7	9	12	
	50	6	8	10	
	60	5	6	-	

Note: *For streets and roads with projected annual average daily traffic less than 250 or short grades less than 150 meters (500 ft) long, grades may be 2% steeper than the values in the above table. (Reference NCDOT Roadway Metric Design Manual page 1-12 T-3)

¹Local Roads including Residential Collectors and Local Residential.

²Major Thoroughfares other than Freeways or Expressways.

Intersections

1. Streets shall be laid out so as to intersect as nearly as possible at right angles, and no street should intersect any other street at an angle less than sixty-five (65) degrees.
2. Property lines at intersections should be set so that the distance from the edge of pavement, of the street turnout, to the property line will be at least as great as the distance from the edge of pavement to the property line along the intersecting streets. This property line can be established as a radius or as a sight triangle. Greater offsets from the edge of pavement to the property lines will be required, if necessary, to provide sight distance for the stopped vehicle on the side street.
3. Off-set intersections are to be avoided. Intersections which cannot be aligned should be separated by a minimum length of 60 meters (200 ft) between survey centerlines.

Cul-de-sacs

Cul-de-sacs shall not be more than one hundred and fifty (150) meters (500 ft) in length. The distance from the edge of pavement on the vehicular turn around to the right-of-way line should not be less than the distance from the edge of pavement to right-of-way line on the street approaching the turn around. Cul-de-sacs should not be used to avoid connection with an existing street or to avoid the extension of an important street.

Alleys

1. Alleys shall be required to serve lots used for commercial and industrial purposes except that this requirement may be waived where other definite and assured provisions are made for service access. Alleys shall not be provided in residential subdivisions unless necessitated by unusual circumstances.
2. The width of an alley shall be at least 6.0 meters (20 ft).
3. Dead-end alleys shall be avoided where possible, but if unavoidable, shall be provided with adequate turn around facilities at the dead-end as may be required by the Planning Board.

Permits for Connection to State Roads

An approved permit is required for connection to any existing state system road. This permit is required prior to any construction on the street or road. The application is available at the office of the District Engineer of the Division of Highways.

Offsets To Utility Poles

Poles for overhead utilities should be located clear of roadway shoulders, preferably a minimum of at least 9.0 meters (30 ft) from the edge of pavement. On streets with curb and gutter, utility poles shall be set back a minimum distance of 1.8 meters (6 ft) from the face of curb.

Wheel Chair Ramps

All street curbs being constructed or reconstructed for maintenance purposes, traffic operations, repairs, correction of utilities, or altered for any reason, shall provide wheelchair ramps for the physically handicapped at intersections where both curb and gutter and sidewalks are provided and at other major points of pedestrian flow.

Horizontal Width on Bridge Deck

1. The clear roadway widths for new and reconstructed bridges serving 2 lane, 2 way traffic should be as follows:
 - * shoulder section approach
 - * under 800 ADT design year - minimum 8.4 meters (28 ft) width face to face of parapets, rails, or pavement width plus 3 meters (10 ft), whichever is greater.
 - * - 2000 ADT design year - minimum 10.2 meters (34 ft) width face to face of parapets, rails, or pavement width plus 3.6 meters (12 ft), whichever is greater
 - * over 2000 ADT design year - minimum width of 12 meters (40 ft), desirable width of 13.2 meters (44 ft) width face to face of parapets or rails
 - * curb and gutter approach
 - * under 800 ADT design year - minimum 7.2 meters (24 ft) face to face of curbs
 - * over 800 ADT design year - with of approach pavement measured face to face of curbs.
 - * where curb and gutter sections are used on roadway approaches, curbs on bridges shall match the curbs on approaches in height, in width of face to face curbs, and in crown drop. The distance from face of curb to face of parapet or rail shall be a minimum of 450 millimeters (1' 6"), or greater if sidewalks are required.
2. The clear roadway widths for new and reconstructed bridges having 4 or more lanes serving undivided two-way traffic should be as follows:
 - * shoulder section approach - Width of approach pavement plus width of usable shoulders on the approach left and right. (shoulder width 2.4 m (8 ft) minimum, 3 m (10 ft) desirable.)
 - * curb and gutter approach - Width of approach pavement measured face to face of curbs.

Appendix E

Planning Area Housing and Employment Data

	1994	2025	1994	2025
Zone	Housing	Housing	Employment	Employment
1	282	682	0	100
2	115	115	138	788
3	168	269	452	922
4	112	132	167	287
5	153	173	31	251
6	50	50	3	253
7	171	370	9	29
8	290	690	12	27
9	337	738	18	39
10	55	55	159	259
11	258	759	2	2
12	324	725	134	185
13	122	292	2	22
14	207	607	58	105
15	141	341	80	80
16	95	295	0	0
17	165	365	356	506
18	96	146	2	2
19	34	184	76	226
20	72	272	9	18
21	430	730	4	24
22	82	482	141	201
23	22	61	0	0
24	10	10	920	1370
25	121	140	172	202
26	19	19	527	747
27	7	50	0	400
Totals	3938	8752	3472	7045

Appendix F

Pedestrian Policy Guidelines

Executive Summary

These guidelines provide a procedure for implementing the Pedestrian Policy adopted by the Board of Transportation in August 1993. The pedestrian Policy addresses TIP projects and makes an important distinction between “considering the needs of pedestrians to avoid creating hazards to pedestrian movements” and the concept of “facilitating pedestrian movements for other reasons.”

Hazards

A hazard in this context is defined as a situation when pedestrian movements are physically blocked in a manner which forces pedestrians to use another mode of transportation or walk in an automobile traffic lane (parallel with the automobile traffic) to pass a barrier. The concept of “not creating a hazard” is intended to allow municipalities to have the flexibility to add pedestrian facilities as part of the project, or in the future after the TIP project is complete. Our current standard cross sections generally do not create barriers for pedestrian movements. One exception is on urban bridges where the bridge rail is at the back of the curb.

Quantifying the need for Pedestrian Facilities

Planning studies should evaluate the need for pedestrian facilities based on the degree to which the following criteria are met.

1. Local Pedestrian Policy
2. Local Government Commitment
3. Continuity and Integration
4. Locations
5. Generators
6. Safety
7. Existing or Projected Pedestrian Traffic

Requirements for DOT Funding

Replacing Existing Sidewalks

The DOT will pay 100% of the cost to replace an existing sidewalk which is removed to make room for a widening project.

Preventing Hazards

If there is evidence that a TIP project would create a hazard to existing pedestrian movements, the DOT will take the initiative to not create the hazard. However, if there is not evidence that a TIP project would create a hazard to existing pedestrian movements, the municipality will need to prove there will be pedestrian movements which will be affected within five years by the hazard created by the TIP project.

Incidental Projects

Due to the technical difficulty of describing justification for pedestrian facilities, the committee chose a cost sharing approach to provide cost containment for the pedestrian facilities. The DOT may share the incremental cost of constructing the pedestrian facilities if the "intent of the criteria" are met. The DOT will pay a matching share of incidental pedestrian facility total construction costs up to a cap of no more than 2% of total project construction cost. The matching share is a sliding scale based on population as follows:

Table F-1
Incidental Projects Cost Participation Break Down

Municipal Population	Participation	
	DOT	Local
> 100,000	50%	50%
50,000 to 100,000	60%	40%
10,000 to 50,000	70%	30%
< 10,000	80%	20%

Funding Caps

Under normal circumstances, the cumulative funding for preventing hazards and providing incidental pedestrian facilities should not exceed 2% of the total project construction cost.

Independent Projects

The DOT will have a separate category of money for all independent pedestrian facility projects in North Carolina. The independent pedestrian facility funds will be administered similar to the Bicycle Program.

Right-of-Way

In general, municipalities are responsible for providing any right-of-way needed to construct pedestrian facilities. However, the 2.4 meter (8 foot) berm the DOT generally provides on urban curb and gutter facilities can accommodate pedestrian facilities.

Maintenance

Local governments will be responsible for maintaining all pedestrian facilities.

For further information about the Pedestrian Policy Guidelines please contact the following:

Statewide Planning Branch
NC Department of Transportation
P.O. Box 25201
Raleigh, NC 27611
(919) 733-4705

Appendix G

Transportation Improvement Program (TIP) Project Process

The process for attempting to get a project into the TIP is described briefly in this appendix.

The city council should first decide on which projects from the thoroughfare plan they would like funded and placed in the TIP book. They should not try and attempt to get all of the improvements recommended in the thoroughfare plan into the TIP but select carefully a few of the projects that would provide the greatest impact on the traffic network in the area. These projects should be prioritized by the city council and summarized briefly, as shown on Appendix Page G-3.

After determining which projects are needed in the area then an official letter for the TIP Project Request should be written to the N.C. Board of Transportation Member from the municipality's or county's respective district. Along with the letter, should be the prioritized summary of proposed projects for funding, a TIP Candidate Project Request Form for every project that is to be considered for funding and inclusion for funding. An example of each one of these items is included in this appendix on the pages that follow.

Example

**Note: This is not the official request the City of King submitted to the Board of Transportation. This was done by the Statewide Planning Branch to be an example for what should be enclosed for the Transportation Improvement Program (TIP) Request.*

December 8, 1997

North Carolina Board Member
N.C. Board of Transportation
N.C. Department of Transportation
P.O. Box 25201
Raleigh, NC 27611-5201

Dear Board Member:

SUBJECT: 1998-2004 TIP Project Requests for the City of King

Enclosed find the projects requested by the City of King for consideration in the next TIP update. The list is presented by priority, as approved by the King City Council at their November meeting.

The City of King also endorsed the existing schedule of projects contained in the current TIP for the King Urban Area, with one request. The City of King requests that TIP project #X-XXXX remain as a high priority and keep on the existing schedule.

We thank you for the opportunity to participate in development of the State TIP. Please contact us immediately if addition information is needed concerning any of the enclosed project requests.

Sincerely,

John Q. Public

cc: Division Engineer
Enclosure

**City of King City Council
1999 Proposed Highway Projects (Final)**

SR 1195 & SR 1646 (Industry Drive) TIP Project U-####

- From SR 1166 (Hillsboro Street) to NC 96 (Linden Avenue) widen roadway to a multilane facility, with some new location.

US ##

- From SR 1646 (Industry Drive) to SR 1134 (Shady Grove Road)
- Widen roadway to a multilane facility.

NC ##

- From SR 1609 (Harris Road) to the existing four lane section just south of I-85.
- Widen roadway to a multilane facility.

US ### Business (Williamsboro Road)

- From SR 1522 (Salem Road) to US 158 (King Outer Loop).
- Widen facility to a five lane cross section.

New Connector

- From US 15 (College Street) to US 158 Business (Williamsboro Street).
- New Facility.

US ##

- From US ### (King Outer Loop) to SR #### (Carrington Road).
- Widen facility to a multilane facility.

NC ##

- From US 158 (King Outer Loop) to SR #### (Watkins-Wilkinson Road).
- Widen roadway to a multilane facility.

US ### (King Outer Loop) TIP Project R-####

- From King western planning boundary to the eastern planning boundary.
- Widen roadway to a multilane facility.

Highway Program
TIP Candidate Project Request
(Please Provide Information if Available)

Date 09/08/99

Priority No. 1

County Stokes

City/Town King

Requesting Agency City of King

NCTIP No. U-3322

(if available)

Route (US, NC, SR/Local Name) SR 1195 and SR 1646 (Industry Drive)

Project Location (From/To/Length) From SR 1166 (Hillsboro Street) to NC 96

(Linden Avenue). 2.3 miles (3.7 km)

Type of Project (Widening, New Facility, Bridge Replacement, Signing, Safety, Rail Crossing, Bicycle, Enhancement, etc.)

Widen roadway to a multi-lane facility, with some new location

Existing Cross Section	24	Feet,	Type
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Existing Row	60 to 80	Feet	Existing ADT	8,800 (1995)
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Estimated Cost, ROW \$ 900,000 Construction \$ 4,000,000

Brief Justification for Project	Major Thoroughfare, This facility carries increasing traffic volumes between the industrial sites along this route to NC 96 and the I-85 corridor.
---------------------------------	--

In the adopted thoroughfare plan for King it is recommended that this facility should be widened to a five lane cross section due to the increasing volume and the potential for more development in this area. The city request that this project continue to be funded.

Project Supported By (Agency/Group)

Other Information/ Justification

- ☒ Part of Thoroughfare Plan
☐ Part of Comprehensive Plan
☐ Serves School
☐ Serves Hospital

- ☐ Obsolete Facility
☐ Serves Park
☐ High Accident (# _____)
☐ _____

(Please Attach Map Showing Project Location)

Appendix H

Public Involvement

In cooperation with the City of King, Stokes and NCDOT Division Office, the Statewide Planning Branch of the North Carolina Department of Transportation are appreciative for their effort in making the King Thoroughfare Plan and this final report possible.

The members of the thoroughfare planning working committee consisted of:

City King Staff	Title
Ted Voorhees	City Manager
Todd Cox	Planning Director
Tom New	General Services Director
Andrew Meadwell	City Planner
 Statewide Planning Staff	 Title
James Upchurch, Jr., EIT	Transportation Engineer

The information provided in the following pages consists of informational handouts, dated public notices, response forms, and contact lists all intended to improve the communication process between the North Carolina Department of Transportation and the citizen of North Carolina.



STATE OF NORTH CAROLINA
DEPARTMENT OF TRANSPORTATION

JAMES B. HUNT JR.
GOVERNOR

P.O. BOX 25201, RALEIGH, N.C. 27611-5201

E. NORRIS TOLSON
SECRETARY

KING THOROUGHFARE PLANNING MEETING

Wednesday 7:00PM, September 23, 1998

Project Engineer: James Upchurch, Jr., E.I.T.

StateWide Planning, North Carolina Department of Transportation

AGENDA

- Introduction/ Handouts
- Thoroughfare Planning Process
- Old thoroughfare plan, Transportation Improvement Program, and TIP Projects
- King Planning Area, Contributing factors to traffic congestion
- Future Year Projections and Road Deficiencies
- Proposed Alternatives and Benefits
- Questions regarding Thoroughfare Plan
- Comment Forms

**King Thoroughfare Plan Study of Proposed Alternatives
Meeting Comment Form**

1. What was the most important thing you heard at today's public meeting?

2. On what street or in what community do you live?

The following are all road construction alternatives that will be considered for 1998 King Thoroughfare Plan. Please comment on what you like or dislike about each of them.

3. Widening of King-Tobacco Road / Main Street (SR 1611/1112)?

4. Parallel facility to Main Street?

5. Spainhour Extension (connecting from Old US 52 to NC66)?

6. US 52 / Trinity Road Interchange?

7. Trinity Road Extension?

8. Industrial Drive Extension to Meadowbrook?

9. Newsome Road Re-alignment

Please complete this form and drop it in the box at the front of the room. If you wish to mail this form, fold at the dashed lines and mail to the address provided on the back.

Statement to the newspaper

(James H. Upchurch, Jr., EIT, Statewide Planning Branch, NCDOT)

Event(where, when):

- There will be a presentation and public meeting scheduled on Thursday, August 6th in the King City Council Chambers located on Main Street in downtown King.

Purpose:

- The purpose of this meeting is to receive public comment on the proposed “long range” construction alternatives that would provide relief for future traffic congestion in the King community.
- The North Carolina Department of Transportation uses long range thoroughfare planning to provide safe and efficient future transportation systems to benefit urban planning areas such as King. Out of the adopted construction alternatives, long range plan construction projects are selected and then placed in the 7-year Transportation Improvement Program (TIP).
- The North Carolina Department of Transportation’s Statewide Planning Branch will be assisting the King Thoroughfare Planning Committee in presenting these alternatives. Town manager, Ted Vorhees, and Town Planner, Todd Cox are currently serving on this committee.

Questions/Comments:

In the interest of having a timely meeting, NCDOT will respond to questions and comments both orally and in writing only on long range alternative plans.

Development of the King Thoroughfare Plan

Background

NCDDOT and the City of King have been working on an update of the long-range thoroughfare plan. During this period we have completed:

- Data Collection
- Computer Model Development
- Developed future year land use projections
- Identified future roadway deficiencies
- Developed preliminary recommendations

Identified 2025 Problem Areas

After projecting land use data to the year 2025, this information was loaded into a computer model that simulates the amount of future daily traffic that would use the current roadway facilities in the King planning area. These anticipated traffic volumes were then compared with the existing roadway capacity to determine any congested areas. The congested areas are broken down into two categories over capacity and near capacity. These are identified in the following:



Over Capacity

- **US 52** - from south of King to Main Street Interchange
- **S. Main Street (King-Tobacco Road)** - from US 52 to Dalton Road
- **Kirby Road** - from S. Main Street to E. King Street
- **E. King Street** - E. Dalton Road to the Mountainview
- **Mountainview Road** - from E. King Street to NC 66

Near Capacity

- **NC 66** - the entire length
- **N. Main Street** - Dalton Road to Brown Road

Development of the Plan

As travel demand and population grows, the deficiencies we have identified are likely grow as well. The next step is to develop some preliminary solutions. Improvement options were discussed with the city and county planning staffs, then presented to the city council on September 23, 1998 where it was suggested that they be brought to the public for comments. Before the plan is finalized it needs to be reviewed by both the City Council and the public to ensure that the local objectives are being met. Once this is done, a Recommended Thoroughfare plan can be agreed upon.

Improvement Options

1. **Widening of King-Tobacco Road/ Main Street (SR 1611/1112)** - RJR entrance to SR 1105 (Meadowbrook Drive). This project is listed in the North Carolina Transportation Improvement Program (Project R-2201). Its widening would increase roadway traveling capacity allowing more vehicles to be served by commercial and industrial development. This project is likely to build along with the realignment of Newsome Road.
2. **Parallel facility to Main Street** - The construction of a parallel facility to the west of Main Street (extending from Ingram Drive to Brown Road) would carry approximately 7000 to 8000 vehicles per day, splitting a portion of the future Main Street traffic away from an already high congested facility.
3. **Spainhour Extension (connecting from Old US 52 to NC66)** - This facility would serve as a passage from NC 66 to the Main Street commercial development easing the traffic burden along Kirby Road and at critical future high volume intersections such as King Street and Kirby Road, King Street and Mountainview, and Mountainview and Hilsabeck Road.
4. **US 52 / Trinity Road Interchange** - The purpose of a second interchange in the King Planning area is attributed to the wide speculation of tremendous growth in Stokes County (mainly the King planning area), an increase in Winston Salem Commuters, and any unexpected growth caused by the US 74 construction project.

5. **Trinity Road Extension** - This facility would be a necessary complement to the US 52/ Trinity Road Interchange, and would carry traffic from the north to northwest parts of King to US 52 without utilizing Main Street, an already congested facility.

6. **Industrial Drive Extension to Meadowbrook** - This facility would be utilized by mostly industrial traffic and would act as a through route (parallel to US 52) from Meadowbrook to King Tobacco Road.

Spot Improvement Locations

Inside City limits

1. **Kirby Road @ East King Street** - reduce vehicle stacking in left turn lane across RR
2. **Helsabeck Road @ Mountainview Road** - reduce stacking of vehicles in left turn lane
3. **Kirby Road @ Spainhour Road** - reduce stacking of vehicles in left turn lane
4. **Logan Court @ Moore Road** - reduce the potential for rear end collision
5. **Spainhour @ Moore Road** - establish Moore Road as a continuous thoroughfare facility
6. **Ingram Road @ Meadowbrook Drive** - to reduce unsafe diagonal turning movements

Outside City Limits

1. **Goff Road @ West King Street** - improve conditions accounting for high school traffic
2. **Mountainview Road @ NC 66** - reduce traffic stacking at this major intersection

3. **Crooked Run Creek Bridge @ Goff Road** - decrease flood potential and allow for increased traffic from the high school
4. **Hartgrove Road @ Mountainview Road** - improve sharp angled intersection

Where do we go from here?

- Public Involvement
- Finalize the recommended plan
- The City will then hold a public hearing and may adopt the plan.
- Adoption by the NCDOT Board of Transportation
- Thoroughfare Plan Study report supporting the recommended plan

NC DOT CONTACT LIST

Secretary of Transportation

Mr. Norris E. Tolson
(919) 733-2520 ntolson@mail.dot.state.nc.us

Board of Transportation Member

Mr. Dalton D. Ruffin
(336) 722-2083

Division Engineer

Mr. Douglas B. Waters
(336) 761-2200
Dwaters@mail.dot.state.nc.us

District Engineer

Mr. Michael C. Shaffner
(336) 761-2410

County Maintenance Engineer

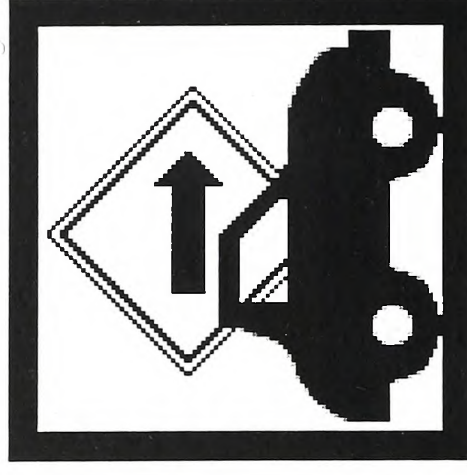
Mr. David Spainhour, P.E.
(336) 593-2978

Statewide Planning Manager

Dr. Marion R. Poole, P.E.
(919) 733-4705

Thoroughfare Planning Engineer
Mr. James Upchurch, Jr., E.I.T.
(919) 733-4705
jamesu@tpswp01.dot.state.nc.us

Thoroughfare Planning for the City of King Public Meeting



November 5, 1998

**North Carolina Department
of
Transportation
Statewide Planning Branch**

Development Process For A New Highway

**Identified in Local Area
Thoroughfare Plan**



**Included in Local Area's
TIP Request**



Feasibility Study is Conducted



Funding Established In TIP



**Project Plans and Environmental
Documents are Prepared**



Right of Way Plans are Prepared



**Right of Way Acquisition;
Final Design Plans are Prepared**



Construction

Development Process For A New Highway

**Identified in Local Area
Thoroughfare Plan**



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Feasibility Study Is Conducted



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**Project Plans and Environmental
Documents are Prepared**



Right of Way Plans are Prepared



**Right of Way Acquisition;
Final Design Plans are Prepared**



Construction

Public Involvement Opportunities in the Highway Development Process

(This is a typical example for a major project. The actual process and public involvement opportunities are established at an appropriate level for each project based on its complexity, and may vary in accordance with federal and state legal requirements.) ● — indicates typical public participation opportunities (varies depending upon specific project)

I. Develop Local Area Thoroughfare Plan

Study Initiation

- Conduct initial field trip
- Meet with local policy boards and technical staff
- – Conduct goals and objectives survey
- – Establish local steering committee (upon local request)

Data Collection

- Collect socio-economic data (land use, population, traffic volumes and employment data)
- Collect transportation network data
- Research environmental and cultural concerns
- – Receive input from various local area sources (needs, problems, concerns, etc.)
- – Local area develops future year socio-economic forecasts

Data Analysis

- Model existing transportation network
- Generate design year transportation information
- Conduct deficiency analysis

Discuss Findings with Local Area Policy Boards, Technical Staff, and Public

- – Discuss deficiencies with local area
- – Discuss possible alternative solutions

Plan Development

- Develop alternative plans
- Review project impacts
- Conduct cost-benefit analyses
- Discuss alternatives with local area staff and policy boards
- – Conduct public information workshop(s)
- Discuss and resolve public comments with local staff
- Select recommended plan in cooperation with local staff and policy boards

Plan Adoption

- – Local government conducts public hearing(s)
- – Present plan for adoption by local government and the North Carolina Board of Transportation

Plan Implementation

- Local government enforces land use controls
- – Present project requests through TIP process

II. Develop Transportation Improvement Program (TIP)

- – Local governments select priorities to include in TIP
- – Board of Transportation holds annual public meetings statewide to update the previous year's TIP
- Transcribe comments and material received at public meetings, and submit to Transportation Board

- Transportation Board members work with NCDOT staff to update TIP
- – Release draft Transportation Improvement Program to the press, public and governments for review.
- Finalize TIP following comments
- Board of Transportation adopts state TIP
- – Metropolitan Planning Organizations receive public comment and approve local TIP
- Secretary of Transportation approves local TIPs

III. Develop Environmental Documents

Notify Public and Government Agencies of Project Study

- – Hold citizen information workshops
- Evaluate comments received at workshops
- – Form citizen's advisory group to get local citizens involved (upon local request)

Select corridors to be studied

- Identify feasible corridors and evaluate costs and environmental impacts
- – Hold information workshop on selected corridors
- NCDOT staff uses recommendations from local citizens, governments and state agencies to prepare a draft Environmental Impact Statement (EIS) or Environmental Assessment (EA)

Prepare Draft Environmental Document

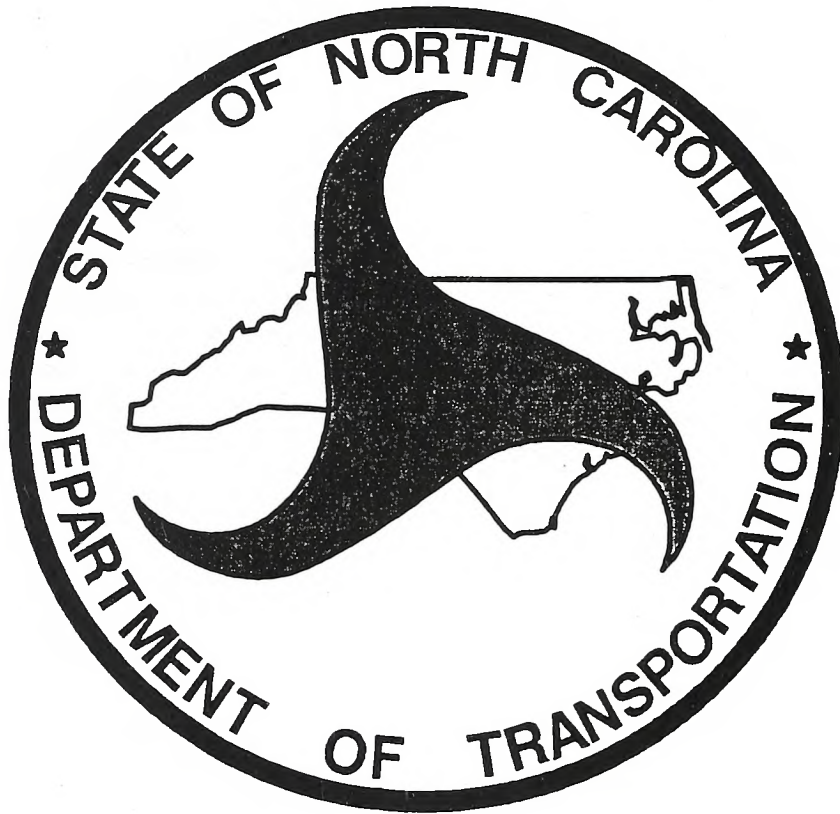
- – Make draft EIS or EA, which addresses the impacts of each corridor, available to public and send to review agencies and local officials for comment
- – Hold public hearing on location of corridor (10-day comment period follows public hearing)
- NCDOT holds post hearing meeting and a corridor is recommended using technical data and information received in conjunction with the public hearing
- Notify public of selected corridor

Prepare Final Environmental Document

- Begin preliminary design of highway in selected corridor {1}
- If final EIS/Finding of No Significant Impact (FONSI) required, send to State Clearinghouse (N.C. Dept of Administration) and federal agencies for 30-day comment period
- Send notification of Final EIS to Review Agencies and Federal Register
- Publish record of decision on preliminary design using comments from public, review agencies and the FHWA
- – Hold public hearing on project design (10-day public comment period follows public hearing) {1}
- Hold post hearing meeting where any changes in design are made if necessary.

{1} These steps are combined with corridor location for most smaller projects.





**Citizen's Guide to the
Statewide Transportation
Improvement Program
(STIP)**



